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1920—Our Twenty-Fifth Anniversary—1945

Contractors and Engineers Monthly

Vol. 42, No. 9 SEPTEMBER, 1945 $3 a Year, 25 Cents a Copy

Covering the Field

Dredged Fill for Road
Placing 1,100,000 yards of hydraulic fill removed a 2.33-mile swamp road from the "problem" category (page 1).

Airfield on Iwo Jima
Seabees, in less than 6 weeks, produced sufficient hot-mix to pave an area on the Iwo Jima Airfield equal to the four main runways at LaGuardia Field. See page 2 for the story.

Seabees Build Mountain Road
Highlights in the construction by the Seabees of the 4,800-foot road to the top of Mt. Suribachi on Iwo Jima in 21 days appear on page 2.

Levee Contracts
Two types of levee work are described in this issue. Concrete paving of levee slopes to protect them from wave wash is covered on page 6. On page 77 is a description of the rebuilding and repair of flood-damaged earth levees.

Slope Planting
An ingenious use of machines and efficient use of men speeded up the slope planting of honeysuckle vines for erosion control. See page 7.

County Road Work
A county bridge-replacement program is described on page 10; an article on the administration of Federal Aid for secondary roads appears on page 30; on page 61 is a discussion of the road problems of a large rural county; and on page 89 is a resumé of recent state laws affecting county roads.

Aggregate Production
Washed, crushed, and screened gravel for cover coat for a resurfacing job as well as aggregate for hot-mix paving, amounting to 30,000 tons was produced by a crushing plant set up by a small stream. See page 27.

Bridge Construction
A new crossing of Arkabutla Reservoir in northwestern Mississippi on 1,050 feet of concrete-trestle bridge, with a 100-foot steel-girder span over the river channel, was recently completed. When floods washed out the old bridge, a Bailey Bridge was used as a temporary crossing. See page 41.

Winter Problems
The snow and ice season will soon be here. On page 44 you will find some suggestions for meeting some of the many problems it will bring.

Sewer Construction
A high water table necessitated the use of a wellpoint system on a contract for the installation of sewers in a war-boom town. See page 54.

Highway Maintenance
Stockpiling aggregate in advance and the use of two mechanical loaders made possible the seal-coating with tar and limestone of 13 miles of 20-foot highway in four days. See page 59.

Swamp Road Is Built On Long Dredged Fill

Contractor Uses Clamshell And Hydraulic Dredges to Rebuild North Carolina's Most Troublesome Highway

By WILLIAM H. QUIRK,
Eastern Field Editor

✦ BUILDING a road through a swamp has always been one of the greatest problems confronting highway contractors and engineers, and the 2⅓-mile width of swamp east of Elizabeth City, N. C., has long resisted continuing efforts of man to construct a permanent durable highway across its treacherous surface. Many roads have been thrown across this waste land, but until the present none has succeeded in keeping itself from being engulfed by the murky morass. A road across this swamp is necessary in order to connect Elizabeth City, in the northeastern corner of the state, with the maritime counties along the coast, and also to tie in with the highway to Norfolk, Va.

A contract awarded to R. C. Huffman Construction Corp. of Buffalo, N. Y., and Norfolk, Va., on its low bid of $316,813, called for the removal of the root mat and 591,300 cubic yards of muck, and placing 899,300 cubic yards of fill for a road 2⅓ miles long, with a 40-foot graded roadway section from which the earth fill drops to the swamp surface on 5:1 slopes. Actually about 1,100,000 cubic yards of fill material was pumped to compensate for losses and shrinkage amounting to about 15 per cent. For this project, the State received eight bids, the highest being $694,000. A 22-foot asphaltic pavement will be placed on this fill under a separate contract.

The swamp begins near the east bank of the Pasquotank River which was bridged in 1931 with a modern bascule structure, replacing the old drawbridge connection to Elizabeth City located on the river's west bank. The surface of the swamp is covered by a root mat 2 to 6 feet deep, of slowly decaying vegetation but capable of sustaining trees up to 4-foot diameter whose roots grow horizontally to great distances. This deceptive surface of trees, grass, and wild brush floats on a soft organic muck which is about 90 per cent fluid, with no bearing value whatsoever, having a depth varying from 12 to 47 feet. Beneath this suspension of muck is a firm bottom of sand and clay.

Early Road Efforts

Private enterprise had built across Ferry Swamp, its local name, a narrow

(*Continued on page 16*)

OPPORTUNITY UNLIMITED

C. & E. M. Photo

Sand fill was pumped from 3,000 to 7,000 feet by the Blue Heron hydraulic dredge for a new 2½-mile road across a swamp in North Carolina.

Wet Soil Is Problem In Airport Grading

Contractor Puts Much Equipment to Work to Dry Material Before Placing It in Fills; 4,000,000 Yards Moved

✦ AT the new airport under construction near Dubuque, Iowa, McVaugh-Haynes Co., the Detroit, Mich., contractor performing the work for the Civil Aeronautics Administration, encountered some difficulty in drying the available soil to obtain specified compaction of the heavy fills which constitute much of the job.

This project to provide an improved airport on a site of 835 acres lying 10 miles southwest of Dubuque between U. S. 61 and 151 includes the construction of two runways 150 feet wide, one southeast-northwest 5,600 feet long and one north-south 4,900 feet long, with the necessary taxiways connecting them. The longer runway includes a 1,000 x 500-foot area cleared of all obstructions and graded at each end, while on the shorter runway this length is reduced to 150 feet at the south end and 500 feet on the north end. The lateral grading limits extend 300 feet each way from the center lines of the runways and 100 feet from the edges of the taxiways, with 4 to 1 slopes provided in each case.

Underdrains of 8-inch vitrified-clay pipe are used and an extensive system of storm drainage, of 12 to 36-inch pipe, is provided for in the design. Reinforced-concrete pipe is used for 24, 30, and 36-inch sizes, and vitrified clay in the smaller-diameter lines.

Heavy Grading Required

The rolling site selected for the construction of this airport was the best and most economical available, considering the topography, the menace from high water at sites closer to the Mississippi River, and the other factors involved; but it necessitates the movement of approximately 3,790,000 cubic yards of earth and an estimated max-

(*Concluded on page 48*)

Seabees Hit Iwo Jima

They Build Mt. Suribachi Highway And a Huge Permanent Airfield

Trucks Used the 4,800-Foot Road With 10 Per Cent Grade In 14 Days; Job Completed In Three Weeks

By R. P. DAY, CCM, USNR

✦ When Joe Rosenthal of *Associated Press* took the famous flag-raising photograph at the top of Mt. Suribachi, he followed the troops up the 554-foot mountain on foot over a steep and tortuous path. The Japanese did it that way for decades. Less than a month after Joe made his picture, Seabees had finished a two-lane highway, 35 feet wide, from the bottom to the top of Suribachi. In less than 24 hours, an Allis-Chalmers HD-14 tractor with a bulldozer had pioneered its way to the summit. In 14 days the first heavy trucks went up. In 21 days the road was finished. Those are a few of the highlights in the story of the most famous highway of the Pacific campaign.

Press Association Photo

Suribachi Itself

Mt. Suribachi, a geologically new volcano with a well defined crater, is located at the southernmost tip of Iwo Jima in the Volcano Islands of the north Pacific Ocean. It rises 554 feet above the level of the sea, and is shaped exactly like a scoop of ice cream. Its sides are so steep that the Marines, in taking it from the Japs, had to lower their wounded men by cargo booms. It is the highest point on the island.

Suribachi is a perfect story-book volcano. Its base and core are solid andesitic lava rock, dating from the age when molten lava poured from Suribachi's crater, overflowed and spilled over the land. Specks of sulphur dot its sides. Steam hisses out from cracks and fissures. The last eruptions of Suribachi seem to have been blasts of ash and dust, so, while the base of the mountain is rock, much of the upper portion is volcanic dust and consolidated ash which can be cut very easily by either a bulldozer blade or a tractor-drawn scraper.

Seabees Take Over

Seabees of a Navy Construction Battalion landed less than 24 hours after Marine troops stormed the beaches. Several battalions were active on Iwo, but the Mt. Suribachi Road is the work of only one battalion; in fact, the road was pushed through by only a small percentage of the men of that outfit. Other work, just as important, was also in progress.

Because Mt. Suribachi is so high, it was natural that military installations should be located there. The Japs thought enough of it in the years past that they forced Korean laborers to carry cement, on their backs, up a narrow pathway which twisted and threaded its way to the top. The Americans ordered a highway for Suribachi before the fighting had progressed very far, and construction began on March 6, seventeen days before the island was secured.

Japs still lurked in caves all over Suribachi, and combat troops were still blasting and burning them out. Twisted, torn trees stuck out from the rocks around Suribachi's base. The area had not been entirely cleared of land mines, and unexploded shells littered the ground.

Seven tractors were used. Five of them were Allis-Chalmers HD-14's; the other two were Caterpillar D7's. There was an urgent time limit to meet; 125,000 cubic yards of earth excavation and about 30,000 cubic yards of rock work, involving drilling and shooting, were necessary. The road, 4,800 feet in length, had to get to the top of Suribachi, somehow, with grades of not more than 10 per cent. Trucks with the material for Mt. Suribachi's summit were practically panting for passage.

Working Up

It was decided to try to pioneer a road to the top, to get the tractors and bulldozers up there, and then to work towards the bottom in the same man-

(*Continued on page* 33)

Portable Asphalt Plant With Abrasive Aggregate Produced a Half Million Square Yards in a Month

✦ GREAT changes have been wrought at Iwo Jima. Giant B-29 bomber runways have been extended through the rugged gullies where fanatical Japanese fought the U. S. Marines. One portable asphalt plant turned out nearly 500,000 square yards of black topping for these two strips in about one month.

Getting the Jump

As has been the case in several Pacific Ocean locations where portable hot-mix plants have been set up, the boiler capacity has not been sufficient to meet the rated maximum of 120 tons an hour. Hard-pressed Seabees have had to figure output at maximum capacity because they in turn have been accountable for nearly impossible schedules. It was a rat race without end; a rack which separated the boys from the men. So the Seabees have done here what other asphalt men have had to do before them, shanghai air compressors from somewhere to run the drier burners. That arrangement leaves the boiler steam available for heating bitumen.

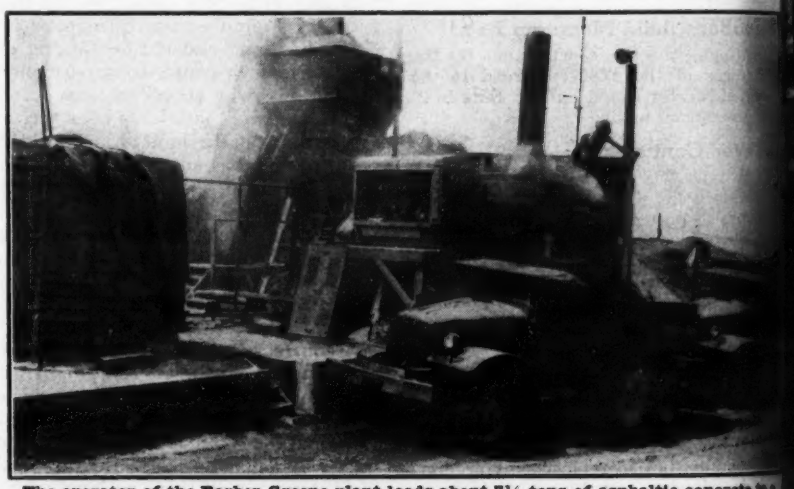
The Iwo Jima set-up is Barber-Greene. Its single set of driers, its hot elevator, and its pugmill were all made by that manufacturer. Its steam plant consists of three Cleaver-Brooks three-car heaters and two Dutton 60-hp w right boilers, diesel-fuel fired. Fo 210-cfm Worthington, one 210-cfm Sul livan, and one 500-cfm Chicago Pneu matic compressor were installed t atomize the fuel for the drier burner and to furnish incidental air for clean ing up around the plant.

Quick-acting Seabee officers w "on the ball" about this matter of a compressors. Originally the job h looked like solid rock from reconnais sance-plane height. Compressors ca to Iwo for purposes other than to ope ate an asphalt plant. They were quickl pressed into service at the plant befor they could be removed for distributio to another base.

Aggregate Troubles

The plant was set up and began ope ating on May 9, 1945, forty-seven day after the island was secured. Sinc rock-crushing machinery had to be in stalled and extensive earth work an grading done on the airfields, the delay in completing the asphalt plant is per fectly reasonable and should not be unfavorably interpreted.

When the first mineral aggregate be gan to arrive at the asphalt-plant build ers, the Seabees knew they were in for trouble. The rock was so hard that it failed to produce fines when it was crushed. It came from roll crushers at



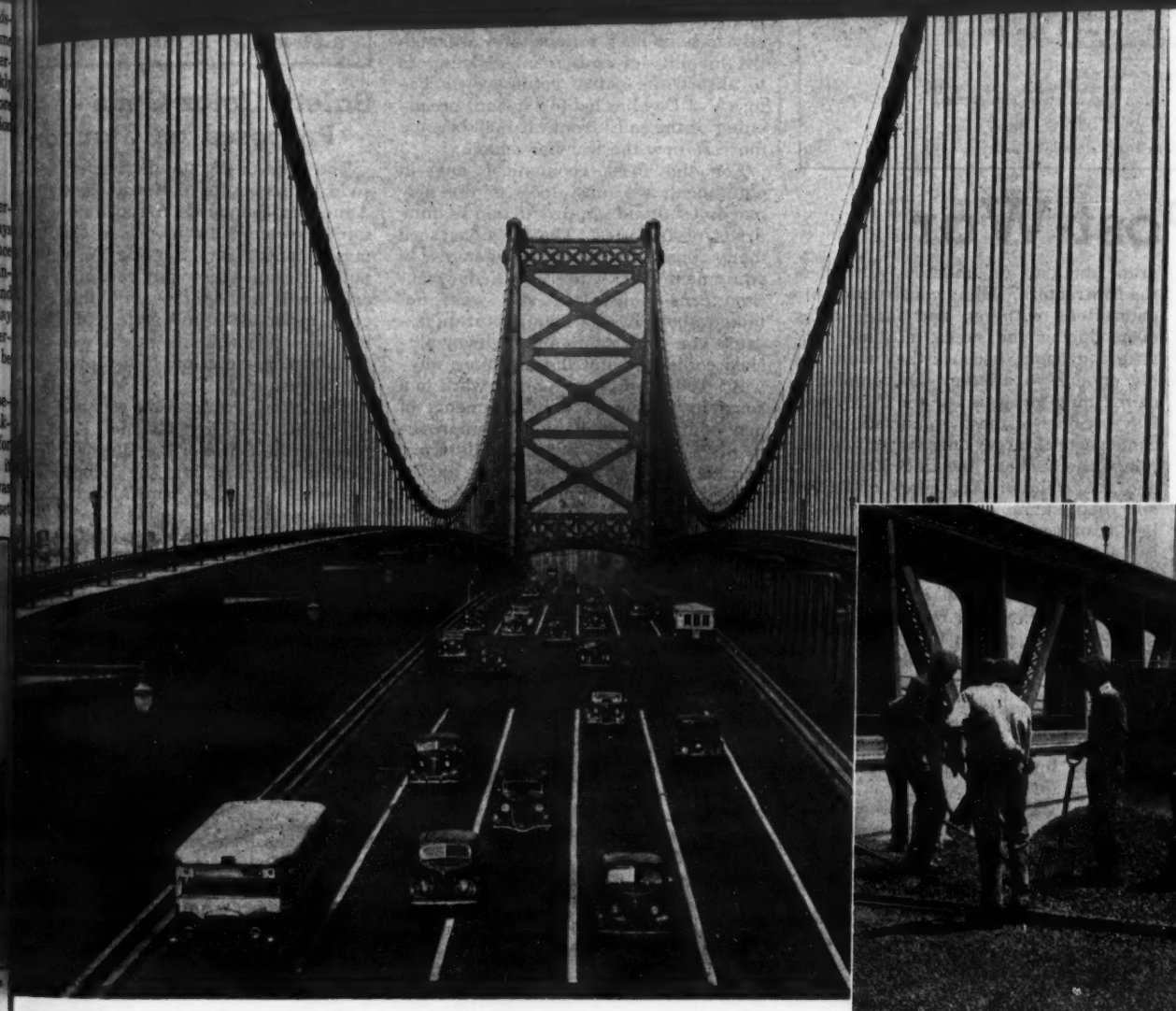
The operator of the Barber-Greene plant loads about 7½ tons of asphaltic concrete to a Diamond T dump truck for hauling to the airfield on Iwo Jima.

at ½-inch clearance deficient in No. 200, 100, 60 and 40-mesh sizes. It was immediately apparent that these would have to be added at the plant. Another feeder leading to the cold elevator was built for this material. The stockpile, kept up by trucks and controlled by two Allis-Chalmers tractors with bulldozers, was then separated so that the two sizes could be fed to the plant as needed.

(*Continued on page* 71)

Pioneering a path to the top, this Allis-Chalmers HD-14, driven by James D. Ballard, MM2/c, of Austin, Ark., was the first machine to reach the summit of Suribachi. Right, the road up the mountain, showing one of the turnbacks. *U. S. Navy Photos*

A *dual type* Asphalt pavement serves this 31,000-vehicle-a-day traffic



Completed heavy-duty Texaco Asphalt pavement on the Delaware River Bridge

Laying the binder course of a Texaco Asphalt pavement on the Delaware River Bridge, which links the cities of Philadelphia, Pa., and Camden, N. J. The contractor was the Union Paving Company of Philadelphia.

Not many pavements meet as severe a test as the new Texaco Asphalt surface on the Delaware River Bridge at Philadelphia, Pa. Last year's 24-hour traffic averaged 31,000 vehicles. As an indication of what post-war traffic will be, 83,041 vehicles crossed the bridge one record-breaking Sunday before Pearl Harbor.

An interesting feature of this heavy-duty, six-lane Texaco Asphalt pavement to engineers is the dual type of construction employed. The four outer lanes, intended primarily for heavy, slow-moving vehicles, are paved with a two-course, plant-mixed pavement of the Sheet Asphalt type, which consists of a 1½-inch binder course and 1¼-inch wearing surface. The two center lanes, restricted to faster-moving vehicles, have a two-course, plant-mixed pavement of the Asphaltic Concrete type, also consisting of a 1½-inch binder course and 1¼-inch top.

Whatever the volume of traffic served by your street, highway or airport runway, there is a type of Texaco Asphalt construction exactly suited to your needs. A Texaco Engineer, who is an Asphalt specialist, will be glad to discuss your paving problem with you and offer his recommendations. Write our nearest office.

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Contractors and Engineers Monthly

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CONTRACTORS AND HIGHWAY ENGINEERS AND COMMISSIONERS

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This Is "Post-War"

Just as the construction industry did the spadework which made possible the speedy training of our military forces and the tremendous wartime production of matériel, including the atomic bomb, construction will pace the world's return to peacetime production. It can be the bulwark against the increasing tide of post-war unemployment.

Now that the world is at peace, we must face its problems with an even greater sense of individual responsibility. The era of "let the Government do it", the period of tossing all decisions in the lap of some Federal bureau or official for decision, is over. The God-given sense of right and wrong should be the guide for every man and woman as he expresses his thankfulness for the end of the struggle, with its untold suffering by mankind, and the needless expenditure of irreplaceable natural resources. If the age-old golden rule becomes a part and parcel of every individual act, the world will become a better place in which to live and do business. That is your *individual* post-war responsibility.

Now, what of those plans that would be needed at some nebulous hour of the future, the end of the war? There are still many sections of this country where the number of contract plans is too small to insure construction, for even the first post-war year, at the volume required to give local employment to those who should be absorbed in active construction and in the production of equipment and materials to implement it. In those states and communities, the responsibility rests squarely on the shoulders of the politicians and subservient engineers who did not have enough ingenuity and guts to do something about it. They can be dispensed with in our post-war world.

One of the first acts of the reconvened Congress, possibly even before these words penned the weekend following the collapse of the Nips can reach you, will be the formal declaration of the end of the war and the appropriation of the first $500,000,000 to permit the Federal-Aid Act of 1944 to start functioning. At last reports, many states and their subdivisions were not ready to take up their share of this aid. The program of needed highway construction presented with great care and at great length before the committees of Congress convinced them of the necessity for these funds. But, if the same groups who presented the evidence of the need fail to have approved plans to go ahead with their full share, then the Congress will and should turn a deaf ear to further aid in any like amount, and cries of "pork barrel" will surely be raised by antagonistic groups. Makers of plans, there lies *your* responsibility.

With the post-war construction program about to get under way, what of the contractors? Many construction organizations withered and faded away even during the great military construction boom, because they were not big enough to attempt the completion of the huge projects for the Army and Navy. Some of these organizations became parts of larger ones, or individuals joined the Seabees, the U. S. Engineers, and the Aviation Engineers and have left their stamp on jobs well done in less than record time from Bizerte to Iwo Jima and Okinawa. These men will be coming back with a greater zest for peacetime construction than ever before, so the ranks of responsible contracting organizations ready to bid on private and public projects can be filled rapidly. Contractors, the reorganization of your outfits through the selection of veterans of the construction forces of this war is *your* responsibility in preparing to build new civil-engineering structures for peace.

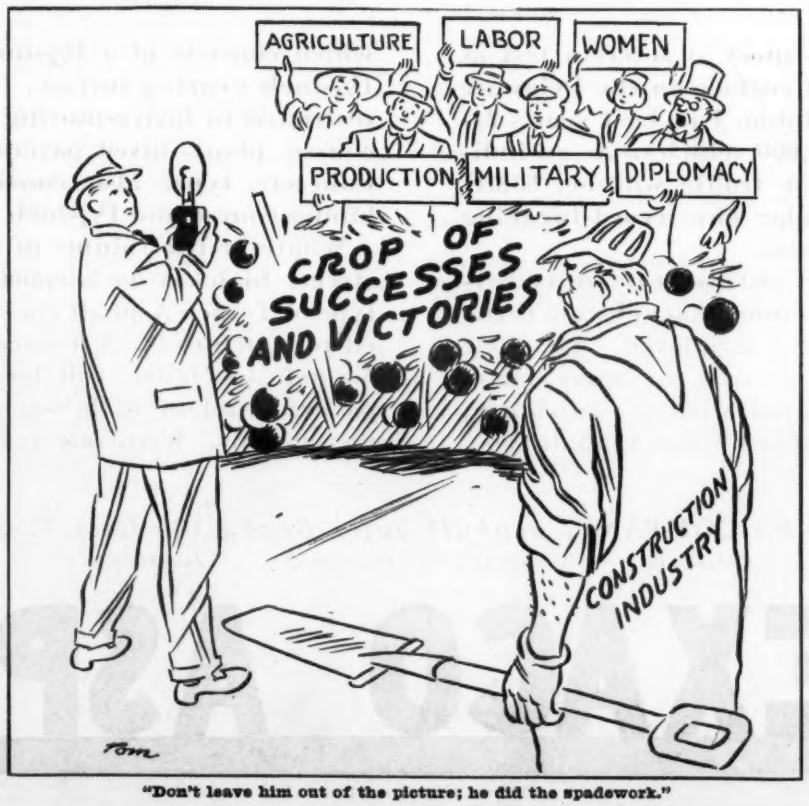
Finally, we turn to equipment, old, surplus, and new, to make possible the activities of construction. There are still many patched-up machines in the hands of contracting organizations. It costs much just to keep the old equipment going, and there is a desire to replace it for economy's sake. Replacements can come from three sources: surplus equipment no longer needed to build new airfields and tactical roads to the front; the pool of equipment still under military control in this country which was used to build domestic training facilities but which was not in the prime condition necessary for front-line service; and the production lines of our manufacturers, now ready to roll out equipment in far greater volume than ever before.

Since all military services have agreed that equipment overseas will remain there, to be sold to local operators and thus create further demand for "Made in U. S. A." machinery, we need not consider that as a possible source of equipment for post-war construction at home. The "spot-sale" method of disposing of surplus equipment within our borders seems generally to have been satisfactory, although the inability of equipment distributors to absorb the entire volume even before V-J Day has led to constant broadening of the sales front. It may become more so now the war has ended.

For the most economical buy in equipment, we must look to the new machines already in production in hundreds of factories. The war has seen many unannounced improvements in equipment that, while not in the wartime censorable class, still were not talked about by the manufacturers because you contractors and highway officials could not buy the machines anyway. Today you may look forward to a constant stream of announcements of new equipment available with improvements. The outfit that has only worn surplus property will be greatly handicapped in competition with new machines.

Members of the construction industry, the "Post-War World" is here. It is your responsibility as individuals and organizations to create within it new wealth for mankind and greater services for human welfare, to insure use of our natural resources, and above all to keep alive in the hearts of your fellow men that respect for your ability to do things which has resulted from your wartime achievements.

Jobs for veterans with physical disabilities are every employer's responsibility. We urge our readers to analyze the jobs in their organizations to discover which can be filled safely and efficiently by men with various types of disabilities; you will be surprised at how many such jobs there are. If each of us shares in this responsibility, there will be no "disabled-veteran" problem.



"Don't leave him out of the picture; he did the spadework."

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Safety Color Code Proposed as Standard

The basis of the standard safety color code proposed for national use by the American Standards Association is the safety system now in use in Quartermaster and Army Service Forces depots. Because the many returning veterans will be familiar with this color code, contractors and state and county highway departments might well give serious consideration to adopting this safety system.

The Army's color code was proposed in April, 1944, by Colonel F. B. L. Myer of the Office of the Quartermaster General. Prompting the adoption of the plan was the Army's widespread safety problem. Supply depots, with military and civilian personnel running into thousands, are scattered throughout the country. Fires or accidents in these depots held up shipments of vital supplies to the fighting fronts. Because of the constant shifting of military personnel, the value of standard safety measures assumed great importance.

Red, green, yellow, white, and black, and combinations thereof, were the colors selected as standard. Red is used to identify fire-protection equipment, and danger and stop signals. Green is the basic color for designating safety, such as the location of first-aid equipment, dispensaries, stretchers, and safety starting buttons. Yellow indicates the need for caution and marks physical hazards, such as obstacles which may cause stumbling, the projections of machinery, or pillars. Black, white, or a combination of the two designate housekeeping, sanitation, and traffic markings. Solid black, solid white, or either striped or checker combinations are recommended for direction signs, corners, passageways, stairways, dead ends, traffic guides, and refuse cans. Great care was taken not to conflict the signals used in sea and air navigation or rail transportation.

The code, as set up by the American Standards Association, will be sent to safety engineers and organizations throughout the country for suggestions.

Tires for Road Work Given Higher Rating

The Public Roads Administration has secured, through the Interagency Committee for Tires, which is responsible for recommendations to the Office of Price Administration for a higher essentiality rating for highway services as a guide in issuing tire certificates, a new rating for tires used in road work.

The Interagency Committee has raised the essentiality ranking of road maintenance to class 2 from the previous ranking of class 3. In order to secure proper consideration under the new essentiality ranking, state and county highway departments and contractors should note on their applications to the Office of Price Administration that the equipment for which the tires are needed is to be used in road maintenance operations.

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June 29, 1945.

Florida Equipment Company of Jacksonville
10 Stockton Street
Jacksonville, Florida

Gentlemen:

For many years the City of Jacksonville has been using patrol graders for their mixed in place bituminous pavement and also for their shell or lime rock stabilized pavement. The reason for stabilizing with shell and lime rock is owing to the deep and heavy sand streets in certain sections of the city. In dry weather these sand streets are practically impassable, especially at intersections. Using a patrol grader with scarifier teeth is slow and costly work.

In using a patrol grader for mixed in place bituminous pavement, the asphalt has a tendency to roll or ball and quite a bit of it is lost. It is rather hard to control the asphalt contents of the pavement and owing to this fact some parts of the pavement are very rich and others lean. In some types of sand it has a tendency to streak, making it necessary to go back and out out patches and replace with plant-mixed asphalt.

Since we have been using the Seaman Pulvi Mixer Model MHD-72 with "B" rotor, we have been able to get a more uniform job and have had no streaking or had to cut out any patches, and in addition to that, we have been able to save about one-third on our asphalt and cut the time about seventy-five per cent. Therefore, it is a much better mixed in place bituminous pavement. In our shell sand stabilizing pavement, we have been able to get a better and more uniform mix of sand and shell and have saved better than seventy-five per cent on our time. As anyone knows, the time factor in a construction job is one of the main objects, especially since the man power shortage is very acute in this city.

This piece of equipment is ideal for our type of work and we do not hesitate to recommend it to anyone for use on this type of construction.

Yours very truly,

CITY OF JACKSONVILLE
HIGHWAY DEPARTMENT

By: W. T. Brown
W. T. Brown
Maintenance Engineer

Thank You
MR. BROWN

NO WORDS OF OURS COULD ADD TO THE IMPORTANCE OF YOUR MESSAGE.

Still Going Strong!

The book "Soil Stabilization Methods" compiled by Seaman engineers will be sent on request. Just ask for Bulletin E-24.

SEAMAN MOTORS *Milwaukee 3, Wis*

C-111

Levee Slopes Paved With Concrete Slab

Replaces Wood Wave-Wash Revetment on Mississippi; Truck-Mixed Concrete Is Pumped to Forms

✦ THE river-side slope of the earth levee on the east bank of the Mississippi at Chalmette, La., 4 miles south of New Orleans, has been paved with a 4-inch plain-concrete slab to protect the levee from erosion caused by the wave wash from passing boats and high winds during high-river stages. The work was carried out by R. P. Farnsworth Co., Inc., New Orleans contractor, under the direction of the U. S. Engineer Office, New Orleans District, during the early part of the year in anticipation of high water in the spring. This paving was done by a Pumpcrete delivering truck-mixed concrete through as much as 660 feet of 6-inch pipe. Because of the short distance from the concrete mixing plant in New Orleans, truck-mixers could be used, while the Pumpcrete eliminated the operation of a paver and resultant trucking on the levee crown.

This levee had been enlarged in the summer of 1944 with a 2-foot lift, and the original intention was to protect it from wave wash by constructing a wooden revetment along the toe of the river-side slope. The Mississippi River is about 2,500 feet wide at Chalmette, site of the historic battle of New Orleans in the War of 1812, and river traffic is heavy from the delta mouth, at the Gulf of Mexico, for 115 miles northward to the great inland seaport of New Orleans. Consequently wave wash from passing craft and the wind is a matter of deep concern in levee protection.

The U. S. Engineer Office first awarded a contract to W. R. Aldrich & Co. of Baton Rouge, La., to build a wooden wave-wash revetment along 2,170 feet of this levee, but because of the wartime scarcity of lumber the contract was amended, and concrete paving along the river-side slope was substituted for the fence at the levee toe. W. R. Aldrich & Co. then sublet the job to R. P. Farnsworth Co., Inc., which had three other concrete-paving contracts on levee slopes in the southern Louisiana area, and had the necessary organization and equipment set-up to proceed with the Chalmette project.

This section of levee in St. Bernard Parish had been protected by wooden revetments which had been broken up and washed away by the waves. A few scattered pieces of fencing remained but protection was nil. The slope on the river side of the levee varies from 3 to 1 at the flattest sections to 2 to 1 at the steepest points. The 4-inch plain-concrete slabs were laid in 6-foot widths at right angles to the longitudinal axis of the levee, and vary in length from 33 to 42 feet from toe to crown. The slabs are divided into panels not more than 10 feet long, but the top panel of every slab is but 3 feet in length. Expansion joints separate the panels which were laid out in a neat pattern.

U. S. E. D. Photo
At the end of the Pumpcrete line, concrete was chuted into a sectional trough extending to the toe of the slope.

Slope Grading

Before any paving was done, the natural ground surface along the toe of the levee had to be cut away so that the entire slope could be graded. A Koehring 304 dragline with a 55-foot boom and a ¾-yard bucket worked along the batture which, during low-water stages, has a width of from 150 to 200 feet from the toe of the levee to the edge of the water. An average depth of 3 feet had to be dug out at the toe of the slope and the material piled up as a dike along the toe. This earth rampart served also to protect the paving operations when a January thaw sent the river rising to lap at the very toe of the slope.

U. S. E. D. Photo
The 2,170 feet of levee-revetment paving at Chalmette, La., was poured in alternate slabs 6 feet wide, divided into panels not more than 10 feet long. The wood forms, made up of 2 x 4's, were held in place by horizontal struts across the slabs to be poured on the second round.

After the levee had been cut back about one-quarter of the way up from the toe of the slope and roughly shaped, the dragline was moved from the batture to the crown of the levee. Here a 9-foot-wide sheepsfoot roller was hooked on the cable of the dragline and rolled down the slope, pulled back up, and released again. This process was repeated over every foot of the slope until eight passes had been made by the roller. In this manner the levee was well compacted, and possible shrinkage eliminated before any concrete was placed.

Further rolling continued with the use of a 4-ton smooth steel roller, 4 feet wide x 4 feet high, pulled up the slope and then released on the end of the dragline cable. The slopes were pretty well smoothed by this time, and any remaining irregularities were bladed off by a Caterpillar pull-type grader towed lengthwise along the slopes by a Caterpillar D6 tractor.

Form Work

All forms were merely 2 x 4's in assorted lengths from 6 to 20 feet, cleated together by 4-foot lengths of 2 x 4's fastened by 16-penny nails which permitted the forms to be taken apart easily. The forms were set 6 feet apart at right angles to the crown of the levee on all tangent sections. Whenever a curve in the levee occurred, the forms were placed 7 feet apart at the bottom and 5 feet apart at the top of the slope, in order to compensate for the greater length at the toe when the curve in the levee was convex towards the river side. When the levee curved in the opposite direction, the forms were placed 5 feet apart at the bottom and 7 feet apart at the top of the slope.

Two carpenters, each with a labor helper, set the forms in a continuous line from toe to crown of the levee. Alternate pairs of forms were spaced and braced by three horizontal 2 x 4 struts, spaced equidistant up the slope, leaving alternate strips for paving. These struts were 6 feet long and were held in place with a 2 x 4 stake driven in the down-slope side at the mid-point of the strut. Just below the crown of the levee a continuous 2 x 4 form was set along the level to a grade a trifle above the maximum flood stage; in this instance, the grade was set at 20.5 mean sea level which was 0.1 foot higher than the desired grade to allow for settlement. Another continuous 2 x 4 form was set to grade along the bottom of the slope, fixing definitely the limits of the slabs.

A laborer with a long-handled round-pointed shovel then dug a key ditch just inside the form at the top of the slope to make a cut-off wall, 12 inches deep and 6 inches wide at the bottom, which returns to grade 6 inches down the slope. Wooden hand tampers were then used to compact any earth dislodged during the setting of the forms.

Expansion Joints

The four-man carpenter crew next set the expansion joints in the alternate slabs to be poured. These expansion joints, to prevent buckling of the concrete in hot weather, consist of one thickness of 30-pound asphalt-saturated felt paper about 1/16 inch thick and were set vertical to the slope of the levee. The first joints are 3 feet down the slope from the top of the slab, while the rest are spaced at 10-foot maximum intervals. The panel at the toe is shorter in some cases because of the unequal lengths of the slabs. Under each joint an 8-inch-wide strip of felt paper was laid on the ground for the 6-foot width of the slab. In the center of this strip the 4-inch-high joint of the same paper was set.

C. & E. M. Photo
Truck-mixed concrete was delivered to the hopper of a Model 160 Pumpcrete and pumped through a 660-foot 6-inch line.

This expansion joint was supported by a metal construction cap 4 inches deep and 6 feet long with a 1-inch lip folded over from the top to hold the paper in place. This cap, in turn, was supported and held in place at the back or downhill side of the joint by three 8-inch pegs with 4-inch offsets to avoid punching holes in the paper which lay on the slope under the joint.

An 8-inch strip of the felt paper was also placed on the ground at each longitudinal joint so that half its width, or 4 inches, was under each adjacent slab. When one slab was poured, a 4-inch strip of expansion material was nailed to each side of the slab, one nail every 3 or 4 feet, to form the longitudinal joint.

This joint material comes in a 3-foot-wide roll, 72 feet long, and since the widths used were all 4 and 8 inches, the contractor made a device to cut the paper in these widths. The bottom of this unit, made from 2 x 4's, looked like a carpenter's wooden horse. On top of the horse was a 2 x 6 through which projected nails, driven through the sides and spaced at 8, 8, 4, 4, 8, and 4 inches to make up the 3-foot width of the roll. The felt paper was placed on the ground and kept from rolling away by driving a couple of stakes behind it. Another 2 x 6 was hinged on the top of the horse and the paper pulled through the slot. As the paper moved over the nails, they cut it into 4 and 8-inch widths, which were rolled up and taken to the forms where they were easily torn into the lengths desired.

Truck-Mixed Concrete

The concrete used in paving the slabs was furnished by Jahncke Service, Inc., of New Orleans, and hauled in five trucks carrying 4 cubic yards of concrete and one truck carrying 2 cubic yards. The first run of the morning was made from the central plant, 10 miles

(Continued on page 94)

C. & E. M. Photo
Asphalt-saturated felt-paper expansion joints for levee-revetment paving at Chalmette, La., were supported by metal construction caps held in place by three pegs on the downhill side.

Machines and Men Speed Up Planting

A Post-Hole Digger on a Tractor; Topsoil Spotted By Clamshell; Then Four-Man Crew Plants 32,000 Vines

THE roadside-improvement section of the grading contract on the Willow Freeway in Cleveland, Ohio, included the planting of 31,997 Lonicera japonica halliana (honeysuckle to you) on 5-foot centers over the 2 to 1 slopes to stop erosion. The same slopes were also seeded for a quick check to erosion until the vines cover them.

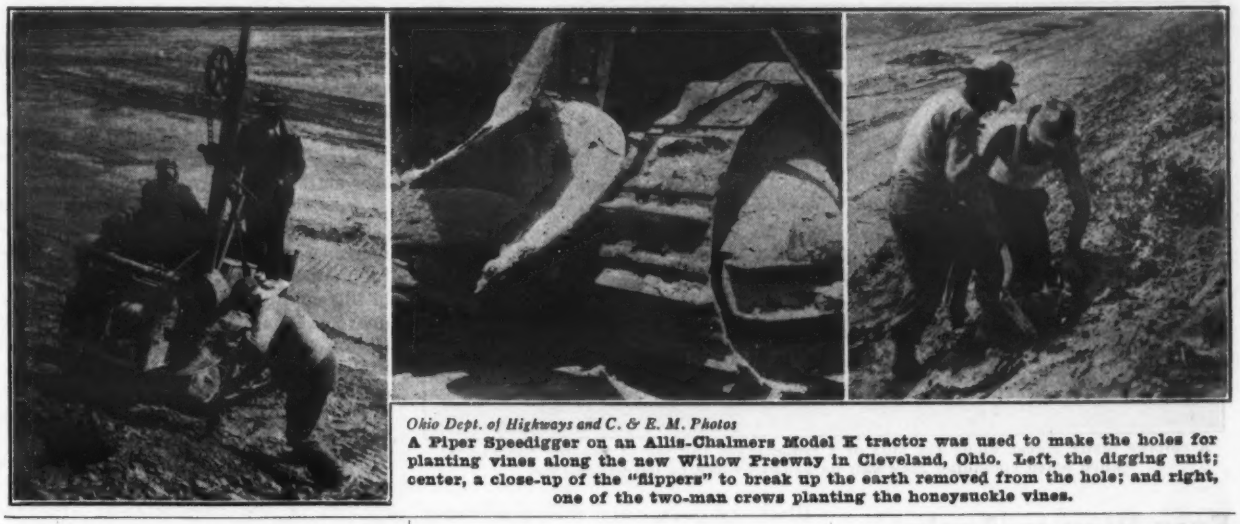
As the high slopes are of heavy clay, the digging of the 18 x 18-inch holes for the vines would have been a long and arduous task but for the ingenuity of the contractor, Lombardo Bros. Construction Co. of Cleveland, Ohio, who mounted a Piper Speedigger post-hole auger on the rear of an Allis-Chalmers Model K tractor and attached it to the power take-off. In order to break up the clay as it was removed from the hole and scatter it over the slope, "flippers" were welded at a flat angle to the top of the two screws of the auger. The tractor drove along the slope, stopping at 5-foot intervals while the post-hole auger was maintained in a vertical position, quickly digging the hole, and then going on to the next.

Selected topsoil was dumped in piles at the top and bottom of the slope and handled by a ⅝-yard Owen clamshell on the 35-foot boom of a Lorain 40 crane. Picking up a full bucket of the topsoil, the operator spotted the bucket over a hole, sprinkled in enough soil to fill it, and then swung the bucket to the next hole. In this way the topsoil was quickly placed in the holes, insuring a satisfactory growing medium for the honeysuckle vines.

After all of the holes had been bored and filled with topsoil, the planting began. This was done by two crews of two men each, one of whom carried the vines from the nurseryman's truck at the top of the slope down to the man who was doing the planting. The latter drove a spade into the back of the hole, that is at the upper side of the slope, pulled the earth forward, set in the vine, and trod it in firmly so that a good healthy tug by the inspector could not pull it loose. The Superintendent for the contractor stayed at the truck and pruned all of the 2-year-old vines before they were planted. In the first three hours of planting one morning these two crews set 950 vines. At the completion of the 8-hour day, they had set 2,000 vines.

Personnel

This planting was a part of the Lombardo Bros. Construction Co. contract for grading structures and roadside-improvement operations on the Willow Freeway. Edward Chadeayne was Project Engineer for the Ohio Department of Highways, and Franklin Marousch, Acting Division Landscape Architect, was in charge of the planting. Perry T. Ford is Director, Ohio Department of Highways, and this work was in Division 12 of which R. J. Edwards is Division Engineer.



Ohio Dept. of Highways and C. & E. M. Photos

A Piper Speedigger on an Allis-Chalmers Model K tractor was used to make the holes for planting vines along the new Willow Freeway in Cleveland, Ohio. Left, the digging unit; center, a close-up of the "flippers" to break up the earth removed from the hole; and right, one of the two-man crews planting the honeysuckle vines.

Standard for Oxychloride Cement Flooring Studied

Acting upon a request of the Oxychloride Cement Association, the American Standards Association has announced that it will set up a committee to develop specifications for flooring made with oxychloride cement. Flooring of this type is widely used in heavy-duty installations such as public buildings, railroad stations, industrial plants, garages and shops. Lack of understanding on the part of contractors has frequently led to improper installation of oxychloride floors, resulting in poor wear.

To improve this situation, the ASA has been asked to develop a standard which will cover specifications and methods of test for materials for oxychloride cement floors; and specifications covering such installations.

THE BIG CONSTRUCTION PROGRAM IS ON!

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The Isaacson Kable Trac-Dozer has earned a wide reputation for continuous, profitable operation on rough, tough western jobs. Much of this reputation is the result of good *balance*. The Isaacson Kable Trac-Dozer is engineered for *balance* with your tractor. Load weight is properly distributed. This reduces wear . . . prolongs equipment life . . . and at the same time assures good traction. An Isaacson Kable Trac-Dozer gives you smooth, fast cable operation . . . powerful high lift . . . instant low drop . . . low cost yardage . . . fast dirt moving.

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A sloping plank placed along the side of a truck eases the job of keeping the hopper filled when spreading rock salt on snow-covered or icy pavements.

Easy Way to Apply Salt on Highway Ice

Many trucks used in spreading rock salt for ice removal on streets and highways have a slight drawback which can easily be overcome by a little work in the maintenance garage. In Manchester, N. H., they have done a slight remodeling job on the truck bodies which has greatly simplified the job of applying the rock salt.

It consists of placing a plank along one side of the truck and fixing it so that it slopes down to a conventional metal hopper at the rear, as shown in the illustration. One man lifts salt bags from the truck floor and pushes them down this plank to a second man at the back. He feeds the salt into the hopper, which spreads a trail of rock salt in a 3-foot-wide lane as the truck travels slowly forward.

The men who work these trucks report that the plank saves a great deal of labor for them, since they do not have to carry the 100-pound rock-salt bags so far across the bed of the truck to reach the hopper.

New Rotary Pump Is Steam-Jacketed

Designed for handling asphalt and similar viscous liquids, a steam-jacketed rotary pumping unit of improved design has recently been announced by the Blackmer Pump Co., Grand Rapids, Mich. The new unit has a capacity of 500 gpm at 150-psi pressure and is powered by a 75-hp gear-head motor with a speed of 155 rpm on the drive shaft. The pump construction is iron, bronze-fitted, and the entire unit is mounted on a cast-iron base. The steam jackets are suitable for pressures up to 125 psi and are located on both heads.

Units in capacities of 50, 90, and 200 gpm, with gear-head motor or reduction-gear drive, are also available with steam-jacketed heads of this construction. All of the new units operate on the "bucket-design" swinging-vane principle, and are self-adjusting for wear.

Further information on these new Blackmer pumps and their application to the problems of unloading and handling asphalt at hot-mix plants may be secured direct from the manufacturer by referring to CONTRACTORS AND ENGINEERS MONTHLY.

Chinese Engineers To Study Our Roads

Chinese engineers who expect to have an active part in the future development of China's highways will spend several months working in various state highway departments, gaining practical experience in highway and bridge design, construction, maintenance, equipment, and materials-testing methods used by highway engineers in this country. These twenty-six engineers are part of a group of over 700 Chinese who arrived in the United States recently to devote a year to the study of communications, engineering, industrial, and agricultural problems. They were brought to this country under the auspices of the Foreign Economic Administration, with the cooperation of the International Training Administration, Inc., and the Chinese Supply Commission. While in the United States they will receive subsistence pay under lend-lease provisions.

An additional group of 500 or more Chinese trainees are expected to arrive in the near future, making this the largest international training program of its kind in world history. After a short orientation course at Georgetown University in Washington, the trainees are assigned to Federal and state agencies and private industrial organizations for actual work in their particular fields.

The twenty-six Chinese studying highway matters are college or university graduates who have degrees in civil engineering. Four members of the group have been assigned to the state highway department in California, five to Washington State, three to Oregon, two to Wyoming, two to Texas, one to Ohio, four to Pennsylvania, two to Maryland, one to North Carolina, one to South Carolina, and one to the materials-testing laboratory of the Public Roads Administration in Washington. Later in the year they will be transferred to other states in order to give them experience in several types of road construction and design in different sections of the country.

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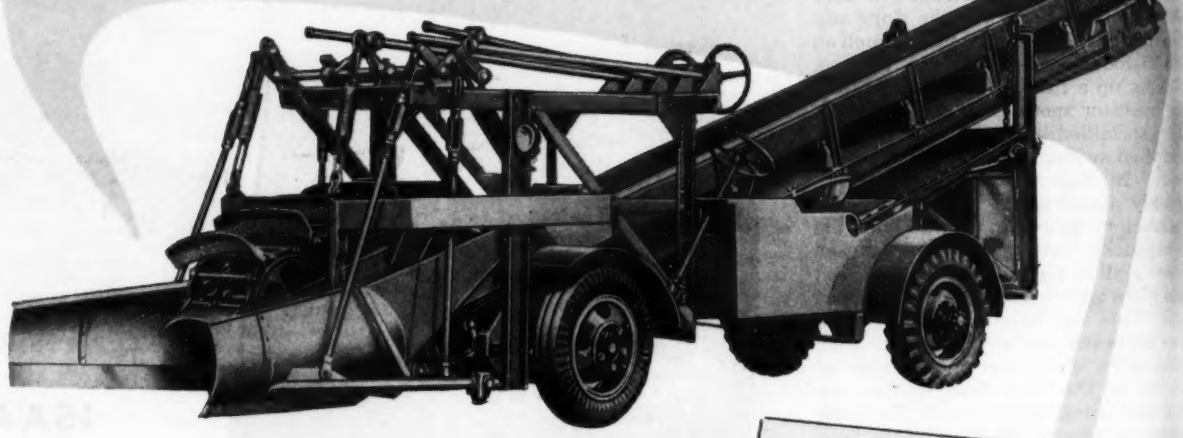

Here's What They're Saying

"Just the tool we've wanted."

"Speeds every one of our loading jobs."

"There's nothing else like it."

"Simplifies our highway maintenance problems."

"It's a lifesaver these busy war days."

"Keeps our roads better maintained than ever before."

Busy highway departments are turning away from hand and other obsolete, costly loading methods . . . finding the modern, Athey Force-Feed Loader a versatile piece of equipment for many wartime maintenance jobs.

Operating as a companion tool with your "Caterpillar" Motor Grader, the Athey Force-Feed Loader is a self-propelled, one-man operated outfit designed to help solve your manpower problems and speed the removal and salvage of surplus material on highway maintenance and construction.

You'll find the Athey Force-Feed Loader an economical, fast, clean tool for handling surplus material in ditch cleaning, road widening and straightening, slope trimming, road grading, building and relocating ditches, salvaging topsoil, and loading oil mix.

Investigate the Athey Force-Feed Loader for your highway maintenance work. See your Athey-"Caterpillar" dealer today, or write direct to Athey Truss Wheel Co., 5631 West 65th Street, Chicago 38, Illinois.

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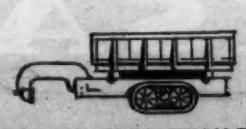

FORGED-TRAK TRAILERS

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DEPENDABLE LOADING & HAULING EQUIPMENT

Phillips Leaves Office Of Surplus Property

Ed P. Phillips, well known equipment distributor of Richmond, Va., has terminated his service as head of the Machinery Division of the Office of Surplus Property, Department of Commerce, having completed a year in that capacity. He has returned to full-time direction of his own companies, the Phillips Machinery Co., in Richmond, Va.; and Phillips Machinery & Tractor Co., Washington, D. C., and Baltimore, Md.

Mr. Phillips was requested to join the staff of the Treasury Department's Office of Surplus Property in July, 1944, to assist in setting up the disposal program for construction and farm equipment. In May of this year, the Office of Surplus Property was transferred to the Department of Commerce. While with the Office of Surplus Property, Mr. Phillips devised the program of nation-wide synchronized spot sales which is producing monthly gross sales of approximately $1,000,000.

During the past year, the Machinery Division, through the eleven Regional Offices of the Office of Surplus Property, has disposed of approximately 35,000 units of construction and farm machinery with a total recovery in excess of $17,000,000.

Corrugated Steel Sheet Piling and Its Many Uses

Several pieces of literature on Caine corrugated steel sheet piling and its many uses in excavation and the construction of retaining walls, bulkheads, sewage-treatment plants and water works, dams, sewers, and similar jobs are available from the Caine Steel Co., 1820 No. Central Ave., Chicago 39, Ill. One of these is a 12-page well illustrated booklet containing general information on the features of Caine corrugated steel sheet piling, including both standard and interlock sections, and describing typical applications. Another is a 4-page manual, covering details of this piling, such as its lengths, various protective coatings, driving caps, pulling tongs, prices and shipments, recommended driving methods, bracing, and similar information needed by a prospective purchaser of steel sheet piling.

Copies of these folders may be secured by those interested direct from the company by mentioning this item.

"Caterpillar" Diesel D8 Tractors pull scrapers on medium hauls in building the mountain-top Kanawha Airport

NEAR Charleston, West Virginia, heart of the Kanawha chemical and industrial empire, a remarkable airport is being built. There's no level ground in the region—nothing but rough sandstone hills and narrow, steep-sided valleys. But by slicing the tops off four adjacent mountains, and filling the valleys between, they're building a huge, modern airport with runways 6000 feet long!

Today some 60 "Caterpillar" Diesel Tractors—track-type and wheel—are busy moving these mountains. Husky D8's are slashing through earth and rock with their bulldozers and tumbling the hilltops into fills as deep as 230 feet.

On the medium hauls, the same sturdy track-type tractors are pulling 25-yard scrapers to the fill. And on the longer hauls of half a mile or more, where road-speed is important, "Caterpillar" Diesel DW10 Tractors, rolling on rubber, take the earth away in "Caterpillar" W10 wagons. The whole mountain-moving operation is a graphic example of *zoned equipment,* effectively used on a contract totaling over 5,000,000 yards.

Also on this job, three "Caterpillar" Diesel Motor Graders are constructing haul roads and runways; and nine "Caterpillar" Diesel D13000 Engines are powering shovels and compressors.

The Harrison Construction Co., contractors on the airport, have had a great deal of experience with "Caterpillar" Diesels, moving more than 32,000,000 yards of earth in the past four years. Says L. S. Wescott, Asst. Chief Engineer: "On our jobs, temperatures have ranged from 110° in the shade to 40° below zero. Mud has been knee-deep and dust almost as thick. Completely equipped repair shops have been non-existent, and, in spite of these conditions, field-repaired 'Caterpillar' equipment has stayed on the job, working night and day."

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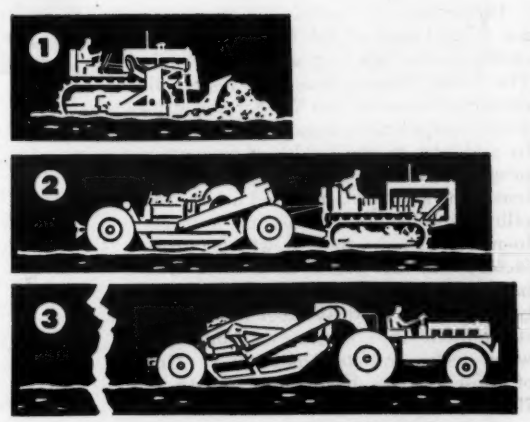

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2 *Track-type tractors for loading and pulling scrapers.*
3 *Wheel-type tractors for high-speed hauls.*

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Old Bridges Rebuilt On County Highways

Replacement Program Was Started Eight Years Ago; Well Organized Highway Maintenance by Districts

By WALTER A. KING, County Engineer, Shawnee County, Topeka, Kansas

✦ EIGHT years ago Shawnee County in northeastern Kansas started an extensive program of replacing obsolete bridges as rapidly as finances would permit. Although the program has been retarded in the past three years, fifty-eight new structures from 8-foot to 153-foot span have been completed and several other structures have been salvaged or their service life extended by various means.

Bridge Program

In the Kansas counties which do not have the county-unit system, the county is responsible for the construction and maintenance of all bridges and culverts over 5-foot span located on township roads, in addition, of course, to all structures located on the county system. On this basis, Shawnee County has to maintain 555 culverts between 5 and 10-foot spans as follows:

29	Concrete arch
54	Concrete slab on masonry
184	Reinforced-concrete box
128	Stone arch
8	Wood deck on concrete abutments
119	Wood deck on masonry abutments
33	Wood deck on piling

There are also 634 bridges with spans over 10 feet, classified as follows:

29	Concrete arch
11	Concrete girder and stringer
29	Concrete integral slab and beam
35	Multi-Plate arch
44	Steel girder and stringer
4	Steel truss, river bridge over 790 feet
58	Steel truss, other than river bridge
37	Stone arch
200	Wood stringer and deck
167	Concrete slab

In the past eight years the following new bridges have been constructed:

3	Concrete arch of 8-foot span
11	Concrete box
4	Concrete slab on I-beams
3	Flat-slab concrete
35	Multi-Plate arch
1	Treated-wood deck and stringer on piling
1	Treated-wood deck and stringer on concrete abutments

The longest of the flat-slab structures has a total span of 153 feet and is generally looked upon as a very neat job. The Multi-Plate arches were nearly all constructed under the WPA relief program, and all have masonry abutments. In addition to the bridge-construction program, an abandoned 60-foot steel truss was salvaged, installed on treated piling, and is now in use on a farm-to-market road where it will be satisfactory for 25 years or more. The useful life of two more river bridges has been extended by steel I-beams to strengthen the structure, laminated wood decks, and steel hand-rails. One of these bridges has a total length of 790 feet and the other 1,224 feet. In the entire maintenance program, the endeavor has been to improve the type of bridge, its roadway width, and to extend its useful life where possible.

A general bridge foreman, reporting directly to the County Engineer, has charge of the three bridge crews, each of which has a crew foreman. These crews have from three to seven men working as a unit. The three-man crew works on general maintenance, such as the renewal of stringers and decks. It has a 4-ton Ford truck with a steel platform, power winch and hoist, which is available for general hauling for any of the crews as needed. The other two crews each have a canopy-type 1½-ton Ford or Chevrolet truck and carry with them a complete set of tools necessary for regular or emergency bridge repair. Normally these two crews operate independently on new construction or major repair or improvement jobs. When a large job comes up, all of the crews work as a single unit. During high water or floods, the three outfits are out on patrol working continuously day and night until the drift has stopped running.

The Department is well supplied with equipment needed for bridge and culvert work, including concrete mixers, Mud-Jack, concrete vibrator, power hoist and pile driver, pumps, tanks, jacks, etc.

Roads and Maintenance

The county highway system consists of 12.9 miles of paved roads constructed in the 1920's, 45.5 miles of black-top, and 230.5 miles of rock or gravel-surfaced roads. The total county mileage is 288.9.

As part of Shawnee County's bridge program, this modern structure with a total length of 153 feet replaced a 60-foot light steel truss, at a bad angle to the highway, on the Bohemian Road north of Rossville, Kans.

Several different methods have been used in black-topping county roads. The most common, and the type of which there is some 37.5 miles, is armor coat. Approximately 1,000 cubic yards of crusher-run rock from ¾-inch down is applied per mile to the surface. The road is left open to traffic until the rock becomes thoroughly compacted, but during this time is maintained daily. After the surface has been well packed, the surplus rock dust is removed by means of a rotary broom propelled by a motor truck.

Then hot MC-2 asphalt is applied at

(Continued on next page)

BETTER CONCRETE FROM ACCURATE WATER CONTROL

Only Ransome Blue Brute mixers, large and small, have all metal spiral cut-offs in the water tank and non-by-passing valves for accuracy of water measurement throughout the life of the mixer.

There are many other reasons why Ransome Blue Brute Mixers have the reputation of making the best concrete at the lowest over-all cost, such as the famous Ransome mixing action perfected during 95 years' experience. The drum tracks of all Ransome mixers are made of high carbon steel for maximum resistance to wear; machined to a true circle after being welded to the drum. Drum rollers of tough car wheel metal, are equipped with double Timken bearings for permanent alignment to assure a smooth-running, long-lived machine with minimum maintenance.

For further details, read Bulletin *No. 181*, available from your nearby Worthington-Ransome Dealer or Blue Brute headquarters.

RB-16

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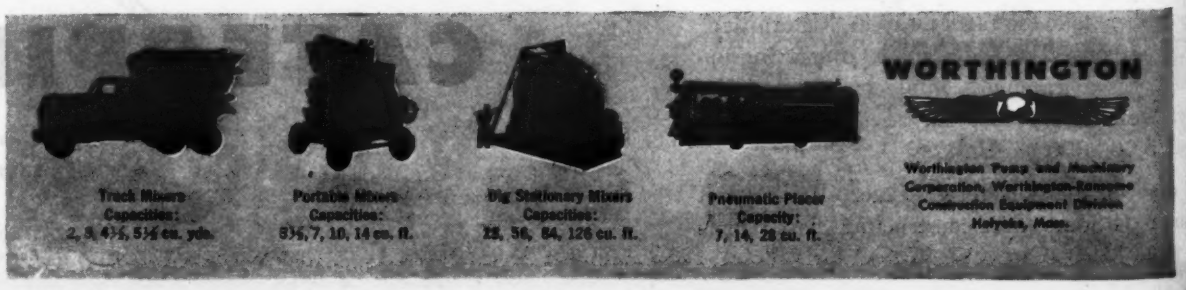
1.
Blue Brutes include: Pavers, Concrete Spreaders**, Concrete Mixers, Concrete Placing Equipment, Big Mixers, Finishing Machines**, Pneumatic Placing & Grouting Equipment, Truck Mixers, Plaster & Bituminous Mixers, and accessories.

2.
Blue Brutes also include: Diesel, gasoline and electric driven Portable Compressors from 60 to 500 cu. ft. capacity in mountings to suit all jobs; Rock Drills and Air Tools in a wide range of weights and sizes; Contractors' Pumps.**

**Postwar Products



Old Bridges Rebuilt On County Highways

(*Continued from preceding page*)

175 to 190 degrees F by a pressure distributor at the rate of 0.5 gallon per square yard for a 22-foot width. If possible, the road is closed to traffic during this operation to allow the asphalt thoroughly to penetrate and cure. This is followed by a seal coat of RC-2 applied at the rate of 0.25 gallon per square yard. The seal is immediately blotted with chat applied by a spreader and then the road is opened to traffic.

The county is divided into four road districts with a foreman in charge of each, working under the direction of the County Engineer. During the pre-war period there were approximately 10 workmen in each district, including 2 maintainer operators, a tractor operator, a grader operator, 3 truck drivers, and 3 laborers. At the present time two of the districts have only one maintainer operator and a truck driver. The other two are not much better off, but one does have four employees and the other five.

Because of the reduction in personnel due to the war, the county maintenance program has been greatly curtailed. Every endeavor has been made to keep the roads well cared for, but when an operation requiring a sizable force shows up it is necessary to close down routine work and assemble all the men available to get the job done. This applies to such operations as crushing, patching, sealing black-top, or special drainage installations. Fortunately, the start of the war found the county with most of its roads well surfaced with crushed rock or gravel. However, as the months and years of war continued with curtailed maintenance, the roads approached a sad state.

County Equipment

The county maintenance equipment consists of two Caterpillar No. 12 diesel motor graders, one No. 112, and one No. 11 of the same make. This provides one diesel-powered grader for each district. There are also four Austin-Western maintainers which were used regularly before the war but which now are used only in emergencies. One of them is assigned to each district. Three Caterpillar D6 tractors and one old Caterpillar Forty tractor provide each district with a tractor, and each has a Caterpillar 10-foot grader assigned to it.

For dirt moving, the County has a Heil 6-yard scraper and a Gar Wood 3-yard scraper. There are also an Allis-Chalmers Model K equipped with a Baker bulldozer, a P&H shovel convertible to crane and dragline, and a clamshell for it. The County operates three gravel pits, one in each district, and a rock quarry and crusher outfit. At each of the pits are a crusher and bin storage.

The truck fleet includes seventeen Ford, International, and GMC trucks of 2½ to 4-ton capacity with dump bodies. These are divided three to each district, with the balance, operated from the central garage, being assigned where needed by the County Engineer.

In addition there are an 800-gallon Kinney distributor mounted on an International chassis, two Allis-Chalmers Model B tractors with highway mowers, and four old McCormick-Deering horse-drawn mowers remodeled with rubber tires and steering devices for trailing behind either the power mowers or trucks to take care of weed cutting. An International I-6 tractor with a Hough loader has recently been added to the roster for use in the gravel pits and for loading dirt along the shoulders. Some of the gravel pits are equipped to use a tractor and fresno for loading.

Central and District Garages

The central garage for the County Highway Department is located in Topeka on the Kansas Free Fair Grounds which are owned by the County. It is a stone structure 75 x 150 feet with one story and a basement, both of which have entrances at grade. On the ground level are located the repair shop, tool and parts room, office, washroom and lockers. In the basement, storage is provided for trucks, and there are an oil room, tire room, tool room, paint shop, a power lift for both trucks and cars, a wash rack, boiler and fuel room, and the bridge-department room. On the first floor, where all repair work is done, is a well rounded group of tools including power grinders, power tools for the blacksmith, a lathe, electric welder, portable gasoline-powered electric welder, and other equipment.

This structure was built during 1934-36 and is a real credit to the community. The grounds facing on U. S. 75 are well landscaped. The entrance to the storage department in the basement faces the storage yard which is below the grade of the highway and, as a result, what unsightliness there might be in connection with a storage yard is not visible to the public. In this building the County is able to care for all repair work and has even built special pieces of equipment, such as rollers, a 6-wheel trailer, and tractor cabs.

The Shawnee County shop and garage, located in the Fair Grounds at Topeka, is an attractive stone structure. Entrance to the basement is provided at grade on the other side of the building.

The four road districts each have

(*Continued on next page*)

Job-Tested Proof that Lorains Are Money-Makers in Rock . . .

A 3,000,000 ton payload of crushed rock in a single year. That's the story of Lorain performance and production on this quarrying operation where each of five 2 yd. Lorain 82's averaged over 50,000 tons of rock a month for twelve consecutive months.

A steady rock diet like this means plenty of power—and Lorains are long on power which is applied through: (1) The Center Drive design which permits ganging-up full engine power on any one operation; (2) the Hydraulic Clutch that cushions impacts and shocks, absorbs stresses and strains, prevents engine stall and protects cable life.

Keep the 2 yd. Lorain 82 (with hydraulic clutch) in mind for those jobs where big production means bigger profits. For complete details get in touch with your Lorain distributor, now!

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Old Bridges Rebuilt On County Highways

(*Continued from preceding page*)

storage garages, some located on county property, and others on leased property. Only very minor repairs are attempted at any of these storage garages.

Finances

During the WPA program, the Boards of County Commissioners in Kansas were permitted to issue Public Work Relief Bonds to sponsor Federal projects. Shawnee County took advantage of this to supplement other revenue for carrying out the road and bridge program. The last of these bonds was issued February 1, 1942.

A law was passed in the 1945 session of the Kansas Legislature permitting the counties to levy an additional mill on tangible property each year for the next five years for road and bridge purposes. Under the terms of this law they are allowed to build up a surplus so that it will be possible to have a reserve fund to be used for the post-war program. Such a levy will provide $100,000 a year for Shawnee County.

The first table below gives the sources and comparative amounts of revenue for the Shawnee County Road and Bridge Fund for the years 1939 and 1944, while the second table gives an analysis of expenditures for the same two years.

Revenue	1939	1944
Ad valorem tax	$ 46,998.08	$ 45,510.84
Residue sales tax	.....	14,515.56
Motor-vehicle license and fuel tax	52,739.71	51,570.83
Sale of materials and labor	497.29	680.67
Equipment rentals	34,045.32	1,471.68
Public Work Relief Bonds	115,000.00	.....
Miscellaneous	13.78	9.45
Total revenue	$249,294.18	$113,759.03

Expenditures	1939	1944
Administration	$ 8,608.56	$ 8,763.17
Maintenance of roads	39,427.59	42,381.33
Construction of roads	71,267.56	1,758.97
Maintenance of bridges	20,773.96	17,476.19
Construction of bridges	16,166.70	6,269.52
Equipment operation and maintenance	71,917.37	31,621.97
Total expenditures	$228,161.74	$108,271.15

Post-War Plans

Shawnee County's post-war plans are not completed but as they stand now definite locations have been selected for twenty-four bridges, at an estimated cost of $237,660, which will require 919 man-months of labor. The plans are ready and the material, Multi-Plate arches, is on hand for eleven of these structures. The other bridges will be of reinforced-concrete design, and plans will be ready for them by the time labor is available for construction. The immediate post-war program for roads calls for 30 miles of grading, drainage structures, and gravel surface for which the plans are ready. Twelve miles of roads are waiting for plans covering grading, drainage structures, and gravel surface while another 10 miles are to be surfaced with crushed rock and then a bituminous top applied. This 51 miles of road work calls for an expenditure of $301,300 and will employ 2,644 man-months of labor.

This new triple Multi-Plate arch culvert on West Dudley Road in Shawnee County, Kans., replaced a 40-foot steel truss (seen in the background) and straightened the road at that point.

This program was prepared several months ago and as the war continued it became apparent that many more miles of roads will have to be regraveled and the bituminous-surfaced roads will require re-oiling.

Practically the entire fleet of county trucks will have to be replaced as soon as any heavy construction program starts. At present only about 25 per cent of the trucks are being operated, thus leaving time for repairs to the remainder.

A part of the post-war program is to strengthen the engineering personnel of the Department. At present there is no assistant engineer or technical help. It is planned to have an assistant with a

(*Concluded on next page, Col. 2*)

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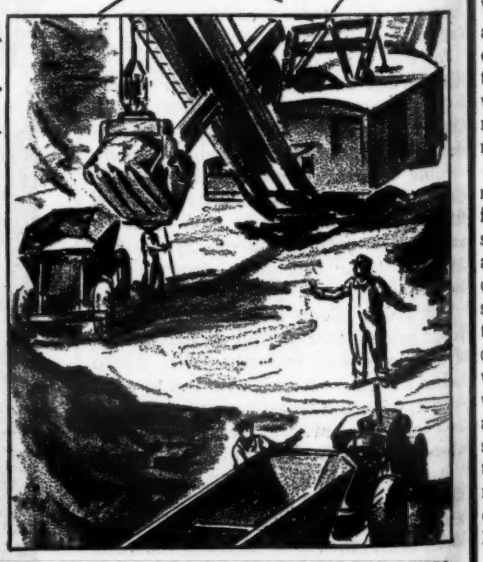
SINCLAIR TANK TRUCKS OPERATE OUT OF 2000 WHOLESALE BULK PLANTS WHICH SERVICE INDUSTRIAL PLANTS, AS WELL AS MANY THOUSANDS OF SINCLAIR DEALER STATIONS, WITH PETROLEUM PRODUCTS.



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The new Buda diesel-nozzle and injector tester is designed for use with all makes of diesels.

New Diesel-Nozzle Tester Announced

A new universal diesel-nozzle and injector tester, a portable unit designed for use with all popular makes of diesel engines, has been announced by The Buda Co., Harvey, Ill. According to the manufacturer, no technical knowledge is required to operate this tester. Any mechanic or diesel-engine operator can measure injector-opening pressures with it, determine accurately the adjustment necessary, check the spray pattern for uniformity, and detect other irregularities, such as sticking needle valves, and dribble and leakage around valve seats.

The Buda diesel-nozzle tester is equipped with a standard hydraulic pressure gage with a 3 11/16-inch dial, 3,000-psi capacity, and 100-pound gradations. Gages of 5,000 and 7,500-psi capacity are also available.

Completely portable, the tester weighs less than 19½ pounds, including its all-steel carrying case, one adaptor, and a removable 12-inch steel handle. The carrying case holds such extras as adaptor fittings, special cradle, "popping" device, extra pressure gages, risers, spray pan, fittings, etc.

Illustrated literature on this new portable diesel-nozzle and injector tester may be secured direct from the manufacturer by referring to this item.

A Race Against Time To Rebuild Dutch Dikes

A job which must be done at all costs is being carried on in the Netherlands to complete repairs on the dikes on Walcheren Island before winter. All areas where the work is being carried on have been cleared of mines, as have the main channels, and the number of workmen assigned to the job was recently raised to 1,250, according to a report by the Minister of Public Works.

Engineers have adopted new technical methods, regardless of cost, in a feverish attempt to rid the island of a seawater current which is having disastrous chemical effects on its soil. One of the methods to be employed, says a statement of the Netherlands Information Bureau, is the costly process of diking in gigantic sand dredges which will continue to operate throughout the winter. In order to bring them out again next summer, small but expensive breaches will have to be made in the dikes. New construction alone will require more than 1,000,000 cubic yards of sand, nearly 90,000 tons of stone, and 1,500,000 bundles of twigs.

Several interesting peacetime uses of war equipment have been developed in connection with this work. One of them is weaving twigs into torpedo nets and placing them over sunken hurdles in the construction of the new dikes. It is also reported that the Netherlands government has taken over from England 18 large "mulberry" caissons, the British development for invasion harbors, and 30 of the concrete invasion breakwaters, for use in this work.

Old Bridges Rebuilt On County Highways

(*Continued from preceding page*)

field party just as soon as men are available, as included in the county highway organization before the war.

County Background

Topeka, the county seat of Shawnee County, is located 65 miles west of Kansas City. The county comprises 554 square miles with a population of 91,247. Farm lands cover 87 per cent of the county, with the average farm consisting of about 140 acres. The principal crops include potatoes, wheat, corn, alfalfa, clover, soy beans, flax, barley, and bromegrass. Nearly one-half of the farm area is classified as pasture land, which accounts for the fact that livestock and dairy products comprise a large portion of farm income.

There are 108 industrial establishments in the county with an annual production in excess of $30,000,000 in the pre-war period. The county is served by four major railroads, and the Santa Fe has its general offices and principal shops in Topeka.

The United States Army has three major posts in Shawnee County, the Topeka Army Airfield, the 832nd AAF Specialized Depot, and the Winter General Hospital.

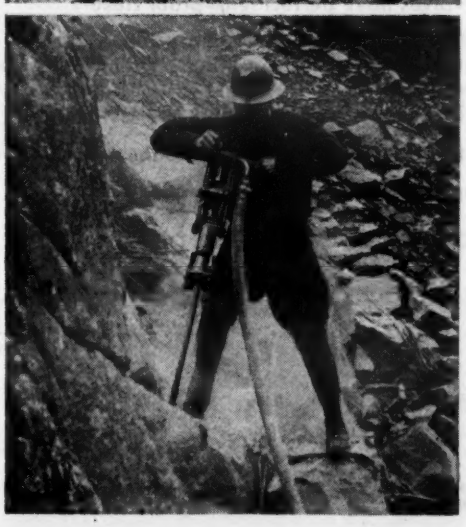
Organization

The Board of County Commissioners is made up of three members, elected from their respective districts for a term of four years. The Commissioners from the second and third districts are elected in Presidential election years and the Commissioner from the first district in the succeeding even-numbered years. The present Board consists of Ed. J. Camp, Chairman, Dale D. Gear, and Ralph Ulm.

In Kansas, county engineers are appointed by and serve at the pleasure of the Board of County Commissioners. In all but three of the counties, the county engineer also acts as county surveyor. In the three largest counties, of which Shawnee County is one, the county surveyor is elected for a two-year term but has nothing to do with the Highway Department except to make legal surveys as required.

The author is completing his eighth year as County Engineer. In some of the counties, each commissioner handles all work in his own district, but in Shawnee County the Department is headed by the Engineer who is responsible to the Board as a whole.

Ed. J. Camp, Chairman of the Board, is a past president of the Kansas Official Council, an association composed of eight organizations of county officers. He is now serving as Chairman of the Legislative Committee of the Kansas County Commissioners' Association. The author was Secretary-Treasurer of the Kansas County Engineers' Association in 1944, and this year is its Vice President. He is a Director of the County Highway Officials' Division of the American Road Builders' Association.



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Wear is also reduced by the lower average compressing speed at part loads. And you can take a K-500 trail-blazing over mountains and deserts . . . *it's the lightest 500-cfm portable available.*

Let an I-R representative tell you more about the Drill-More Regulator and other features available only in Ingersoll-Rand's 500-cfm compressor.

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The post-war Jeep, especially adapted for peacetime work, combines the four basic functions of tractor, light truck, mobile power unit, and passenger conveyance. Here a Jeep, just unveiled to the public by Willys-Overland Motors, is shown equipped with an air compressor, operating a drill for road repairs.

At Last – the Jeep For Post-War Service

A question asked in many tongues all over the world, "What about the Jeep in the post-war period?", was answered recently in an announcement by Willys-Overland Motors, Inc., Toledo, Ohio, that there not only will be a post-war Jeep; there is one.

The peacetime Jeep is described by company officials as "the first vehicle in history to combine successfully the basic functions of the light truck, tractor, mobile power unit, and passenger conveyance. Although it closely resembles the standard military Jeep, which was also developed by Willys-Overland, and embodies the same automotive concept, the post-war Jeep presents special values of its own for construction jobs, lumber camps, oil fields, farms, and many other pursuits.

The balance of power, weight, size, four-wheel drive, dependability, and ruggedness of the military Jeep have been adapted for peacetime service. The most important differences between the military unit and the post-war Jeep are the special power take-off which can be used with the spline shaft for direct power or with the belt pulley, thus making it possible to delegate up to 30 hp to anything from a buzz saw to a thresher; and the changed gear ratios in the transmission, transfer case, and axles. This latter revision results in maximum efficiency while operating at a necessary slow pace on construction, farm, or similar work. A gear ratio is also provided to give a road speed of 60 mph.

Other differences include a new combustion chamber to increase power; a radiator shroud for more effective cooling; a larger clutch; redesigned steering linkage to provide ease of handling and free rolling; greater rigidity in the chassis frame, with reinforcements to aid in attaching equipment and to absorb the loads of heavy drawbar work; rear shock absorbers; and the gear shift lever on the steering column.

Power for the post-war Jeep will be provided by the battle-proved 4-cylinder engine of the type which has driven more than 500,000 military Jeeps an estimated 10,000,000,000 miles.

One of the useful pieces of special equipment is a capstan winch which can be mounted on the frame between the bumper and the radiator, and is driven through a propeller shaft and two universal joints from the front end of the engine crankshaft. A shift lever is mounted on the assembly for engagement. The unit is designed for 5,000-pound pulls, using either ¾ or 1-inch manila rope.

Among the many peacetime services of the Jeep are towing such equipment as plows, harrows, and disks; operating post-hole augers, saws, and similar tools; providing mobile power for a portable air compressor for pavement breaking and street repair; plowing snow; bridge maintenance and painting; and by the addition of other units, by coupling, by power take-off, and through the belt and pulley, its versatility may be enhanced to an almost endless list of jobs.

Further details on the Jeep and its availability for civilian use may be secured direct from the manufacturer.

Standard of Indiana Plans Engineering Research Dept.

Plans for the establishment of an engineering research department and for the expansion and reorganization of its present engineering activities have been announced by the Standard Oil Co. of Indiana, Chicago, Ill. George W. Watts has been named Director of Engineering of the manufacturing department, and D. A. Monro, Chief Designing Engineer of the department. Under the new set-up, Mr. Watts will devote his time principally to the activities of the engineering research department, while all other engineering activities will be under the direct charge of Mr. Monro.

P. L. Krauel has been appointed Chief Engineer of the engineering division, Whiting Refinery, where the company's largest engineering unit is located. The division has been enlarged to include six departments, each to be headed by an Assistant Chief Engineer, as follows: W. G. Guild, for the oil design department; A. T. Milbrook, utility design department; W. K. Brown, for the newly created engineering department; C. E. Dyckman, estimating department; W. R. Burrows, the newly created engineering development department; and D. F. Purdy will continue to supervise the drafting department.

AIR PLUS JAEGER COMPRESSOR

Any Jaeger Compressor will hold air above 90 lbs. pressure for 20 to 25 minutes (5 to 10 times longer than others) THAT'S PROOF YOUR TOOLS ARE GETTING ALL THE AIR!

"Ultra-lapping" process produces precision finished valve surfaces never before obtained.

You've got to hold air in order to deliver it. Because they're individually "ultra-lapped" (an exclusive process) Jaeger "Tough Swedish Twin" valves have perfect leak-proof closure —5 to 10 times more effective than the best ordinary valves— one of the reasons why "AIR PLUS" compressors deliver more air, more efficiently, at slower piston speeds and the lowest known cost in fuel. Ask for Catalog JC-5. It describes the most advanced line of air compressors in America—sizes 60 to 500 ft.

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New Manual Features Off-the-Road Tire Care

Users of off-the-road tires will find an abundance of helpful suggestions and information in a comprehensive 48-page manual entitled "How to Get the Most Service Out of Your Off-the-Road Tires", issued by The B. F. Goodrich Co., Akron, Ohio. The first section describes, in text and pictures, various types of tires for specific jobs and explains how the particular construction of each meets certain requirements. Possible hazards in operation are pointed out, and methods to avoid them.

Seventeen pages are devoted to preventive maintenance through proper loading, correct inflation, road maintenance, care of valves, and other suggestions for conserving tires and tubes. The disastrous effects of overloading, overinflation, rocks between dual wheels, and careless operation are shown in the illustrations, followed by a section on what to do and what not to do to avoid such tire injuries. Other important features of the book are a discussion of proper procedures in mounting synthetic tubes and flaps, and tables listing recommended speeds and tire loads at various inflation pressures.

Copies of this helpful manual on tire conservation and care may be secured gratis upon request to the manufacturer and mention of this publication.

British Branch Plant For R. G. LeTourneau

The establishment of a branch factory in England shortly, with Brigadier W. E. R. Blood, in charge of the British Army Engineers' headquarters at Washington, D. C., as Managing Director designate, has been announced by R. G. LeTourneau, Inc., Peoria, Ill. Maurice Foote, promoted from Superintendent of LeTourneau Plant No. 1 at Peoria, will serve as Plant Manager. Mr. Foote will leave soon for England.

The British branch of R. G. LeTourneau, Inc., will generally follow the lines of LeTourneau (Aust.) Pty. Ltd. at Rydalmere near Sydney, Australia. The company's plants in the United States, in addition to the one at Peoria, are located at Toccoa, Ga., and Vicksburg, Miss. The company was founded at Stockton, Calif., now the headquarters for its Western Division.

New Worthington Dealers

Three new distributors for the Construction Equipment Division of the Worthington Pump & Machinery Corp., Holyoke, Mass., have been announced. They are the Smith Equipment Co., Columbia, S. C.; Power Equipment Co., 601 E. 18th Ave., Denver, Colo.; and Bud Fisher Co., 2000 No. Fourth St., Albuquerque, N. M.

Clear Winter Roads
MORE BUSINESS AND MORE JOBS!

THIS is the third time this road has been cleared out—and on the last trip it stayed clear because the job was done by SNOGO!

Deep snow means drifting banks and drifting banks mean *repeat plowing*—and increased snow clearing costs. Why put up with it when you can toss those banks out of the way once and for all with SNOGO.

Snogo throws the snow into the fields where it cannot drift back. It means *one trip* over the road, no repeat plowing, safer, open roads for the heavy winter traveling that every highway department executive can expect in the future. Snogo means improved winter highway conditions, greater safety for merchandise and school buses, increased business for winter bound communities and reduced damage for highways.

Now is the time to plan your future winter organization. There is a Snogo for every budget.

KLAUER MANUFACTURING COMPANY • DUBUQUE, IOWA

SNOGO A SNOGO For EVERY BUDGET

Swamp Road Built

(*Continued from page 1*)

16-foot corduroy road on top of which a shallow 1-foot dirt fill had been placed; this venture was operated as a toll road for many years. In 1921 the State Highway Commission acquired this road through purchase, and made it a part of the state highway system. Then followed a series of attempts to improve the road and give it permanency.

In 1922 the State made its first effort at improvement by placing additional corduroy on the old road, followed by a 6-inch earth cushion on top of which was constructed a 6-inch reinforced-concrete pavement. Theoretically the slab was to "float" on top of the timber corduroy, but actually the road subsided and the concrete cracked, and in two years' time much of the road was under water.

During 1924 and 1925, untreated-timber piles, averaging 65 feet in length, were driven at 10-foot centers along each edge of the pavement. Boards were nailed along the piles above the level of the "floating" road to hold a 1-foot layer of slag which was placed on the concrete. This method did not produce favorable results and was discarded after about ½ mile of road was thus reconstructed.

From 1926 through 1931 the State Bridge Maintenance Department continued the driving of piles at 10-foot centers along the edges of the road, and topped these piles with 3-foot lengths of 18-inch reinforced-concrete pipe which were then filled with concrete. Timber caps, 14 x 16 inches, were placed across these piles to support a low creosoted-timber bridge made of eight 4 x 14-inch joists, with a 3 x 4-inch strip floor protected at the edges by 6 x 8-inch guards. The 17-foot roadway was covered with an asphaltic wearing surface. This timber causeway was about 3 feet above the surface of the swamp and rendered good service until heavy and high-speed traffic made its maintenance a costly burden. Furthermore its narrow roadway and sharp curves made travel dangerous.

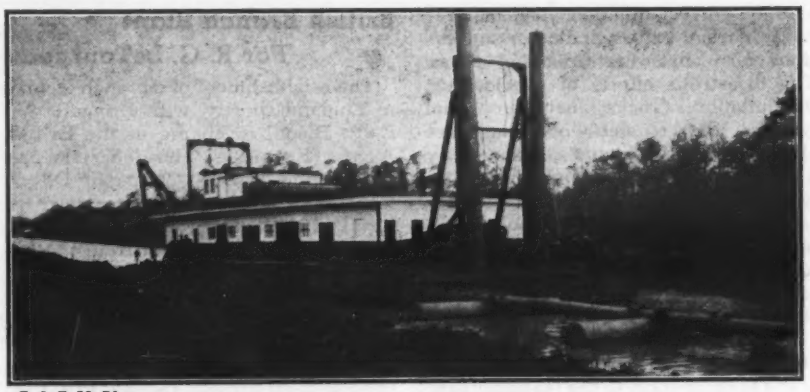
A New Design

Consequently North Carolina highway engineers decided on a new approach to the problem of crossing the swamp. As far back as 1942, plans were made to construct a permanent highway by removing the root mat and muck down to the firm sand and clay stratum for a width sufficient to maintain a stable earth fill which would be pumped in by dredging from pits along the river, but the war delayed the execution of these plans until May, 1944, when the contract to build this road was awarded.

The new road has an average height of 6 feet above the surface of the swamp, while the width of the excavated trench varies with the depth of the swamp as follows:

Depth of Muck	Width of Excavated Trench
15 feet	50 feet
15 to 25 feet	60 feet
over 25 feet	70 feet

Only 175,000 cubic yards of the total fill is above the surface, since for every yard above swamp level there are 4½ to 5 yards below.



C. & E. M. Photo

The No. 3 hydraulic dredge removed about 591,300 cubic yards of muck from the line of new road across a swamp, preparatory to placing the sand fill.

Plan of Operation

The alignment of the new road parallels the existing causeway, U. S. 158 and North Carolina 170, for the most part, but eliminates the sharp curves on the old road and takes advantage of the shallowest sections of the swamp. During the construction operations, traffic was maintained on the old road which was crossed in one place by the new fill. To build the new road the contractor decided to use three dredges, one clamshell and two hydraulic outfits. The clamshell removed the root mat; one hydraulic dredge pumped out the muck, leaving a canal filled with water which the second dredge displaced by pumping in sand fill to form the road.

The contractor's initial step was the clearing and grubbing of a 150-foot right-of-way strip through the swamp with hand labor using axes and machetes. The thickly entwined and interlaced root mat gave sufficient support for men to chop down the trees, cut up the longer sections, and burn the smaller trees and bushes. When this area was leveled, the clamshell dredge No. 3 was moved up the Pasquotank River to a point about opposite the middle of the project where a small bay in the river cut into the swamp within about 750 feet of the new location. From this bay the No. 3, or the "Iron Monster" as it was more popularly known because of its steel hull and corrugated-metal

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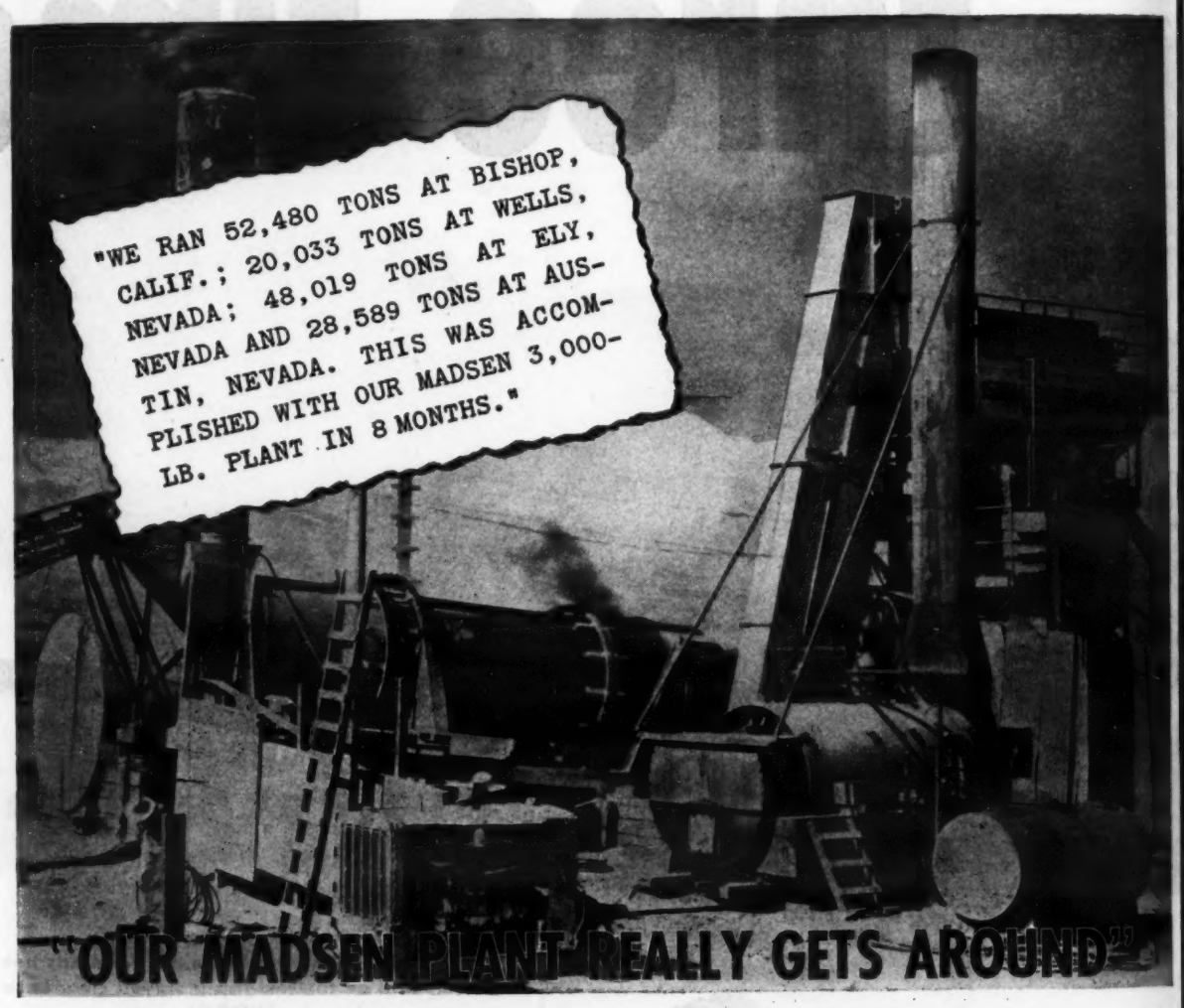
"WE RAN 52,480 TONS AT BISHOP, CALIF.; 20,033 TONS AT WELLS, NEVADA; 48,019 TONS AT ELY, NEVADA AND 28,589 TONS AT AUSTIN, NEVADA. THIS WAS ACCOMPLISHED WITH OUR MADSEN 3,000-LB. PLANT IN 8 MONTHS."

"OUR MADSEN PLANT REALLY GETS AROUND"

The field report, illustrated above, helps to prove another feature of Madsen's *superiority on the job.* Roadbuilders and contractors who travel from job to job recognize mobility and self-erection of Madsen Plants as outstanding in the field.

Here are two Madsen-exclusives that help to make this superiority possible.

JACK ERECTION SYSTEM: In cases where a crane is unobtainable or impractical for Plant setup the Madsen-patented jack erection system saves the day. When set up by power lift, a Madsen Plant can be erected for operation in 2 or 3 hours. Without power, and using one man on each of the four jacks, erection is accomplished in an 8-hour day.

The Madsen jack erection system is simplicity itself ... no cranes, skids, ramps or winches.... another reason to specify Madsen.

MADSEN TWIN-SHAFT PUG MILL MIXER: Madsen engineering experience and precision parts make possible this sturdily constructed mixer that is easily capable of mixing a capacity batch in 30 to 40 seconds. This feature alone assures you 30 to 40 more batches *per day.*

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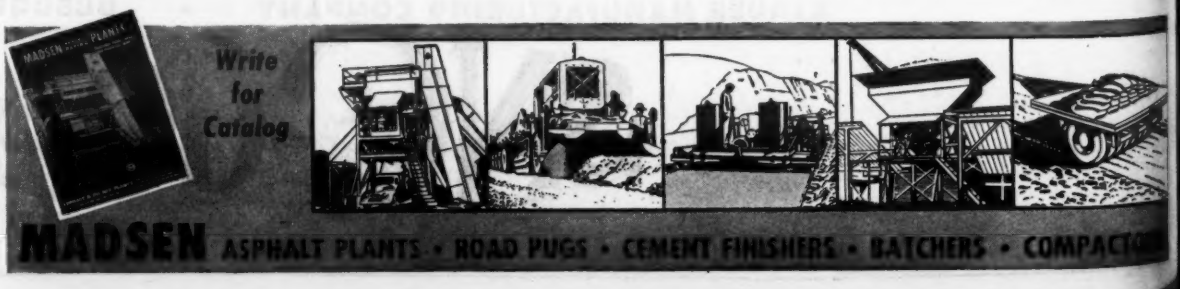

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Swamp Road Built

(Continued from preceding page)

road and to differentiate it from one of the hydraulic dredges also christened the No. 3, dug its own channel through the swamp and reached the line of the new road. The Iron Monster then removed the root mat to its full depth along the 50 to 70-foot new roadway section, also taking out muck whenever necessary to give it the required 6-foot depth for flotation. This dredge also threw off to one side the large sections of trees that had been cut up by the clearing crew.

The Iron Monster

The No. 3, or Iron Monster, is one of fourteen dredges owned by the R. C. Huffman Construction Corp. which has been in the dredging business for 40 years. Built in 1931 with a hull 80 x 30 x 7 feet made of ⅜-inch steel plates, the Monster is equipped with a 100-foot steel boom and a 2-yard Owen heavy-duty clamshell bucket. The prime mover is a Fairbanks-Morse 2-cylinder 150-hp diesel engine located in the stern near its 1,200-gallon fuel-oil tank. Starboard of the engine and driven by it through an 18-inch flat belt is a Westinghouse 90-kw generator which furnishes power to a Westinghouse 50-hp motor operating a dual Vulcan hoist near the bow. One of these hoists closes the bucket and the other raises or lowers it.

At the stern, built in a well outside the center of the hull, is a wooden spud, 15 x 16 inches, 45 feet long, and weighing 4 tons. At the bow on each side is a spud, one being a pontoon, 25 x 10 x 2 feet in size, while the other is known as a bank spud and consists of four 12 x 12's, 6 feet long, to give added stability to the dredge. Thus in wide cuts one forward spud remains on the bank while the other spud or pontoon is floating. They can be interchanged as needed in two hours. Each spud is operated by a Westinghouse 50-hp motor, located near the bow on the port and starboard sides, with power from the main generator.

The boom is guyed at a fixed height from a 46-foot A-frame and swings by means of a Westinghouse 50-hp motor also located in the bow of the dredge and connected to the main generator. The Iron Monster consumes 50 gallons of fuel in an 8-hour shift and is operated by a three-man crew, including Captain Reuben Bryant.

Pulling Piles

The clamshell dredge was also used to pull out the piles in the old road where it intersects the new roadway at about the center of the project, and along the western end where the new alignment coincides with the old road just before the crossing of the Pasquotank River on the bascule bridge. In order to maintain traffic at this western end of the job, the State bridge maintenance forces built a 500-foot-long temporary timber bridge connecting the river bridge with the old road. The maintenance crew also removed the superstructure from the wooden causeway prior to the pulling of the piles.

C. & E. M. Photo

The floating line from the dredge Blue Heron was made up of 40 and 60-foot lengths of pipe carried on pontoons 20 feet long and 30, 36, and 48 inches in diameter. The pipe was connected with flexible rubber joints.

To pull the piles, the cable on the dredge boom was run out and the bucket dropped on the bank while a steel galvanized pipe casing, 1½ inches in diameter and 30 feet long, was jetted into place alongside of the pile to be pulled. A ¾-inch pipe for jetting was placed within the casing, and water was pumped from the canal by a 2-inch Gorman-Rupp pump placed on the deck of the Iron Monster and then through 150 feet of 1-inch rubber hose to the top of the jet. The casing and jet pipes were raised and lowered by three men pulling on ropes to which the pipes were attached, and which passed through pulley sheaves at the end of the boom.

Another crew of three men handled the pipes out on the root mat. When hardpan was reached with the jetting, the jet pipe was removed and three or four sticks of du Pont 60 per cent dynamite were lowered through the casing and placed alongside of the pile, with a fishline run through the casing and attached to the dynamite wires. The casing was then lifted and the firing wires connected to a blasting machine on the shore. One or two blasts were generally sufficient to crack open the 1-foot piles just above where they entered the hardpan, and they were then lifted out by the clamshell bucket. The lengths of the 170 piles that were removed averaged 40 feet, and since they were immersed in fresh water all the time they were excellently preserved.

(Continued on next page)

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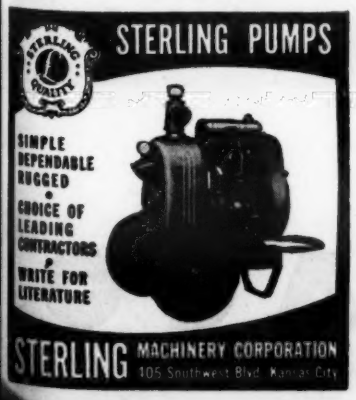

Swamp Road Built

(*Continued from preceding page*)

Removing the Muck

Following about 500 feet, whenever possible, behind the Iron Monster as it removed the root mat came the No. 3 16-inch diesel hydraulic dredge, removing any root mat that was left, together with the swamp muck. To discharge the muck, paths were cleared through the swamp about every 300 feet at right angles to the new road and extending back at least 200 feet from the edge of the canal. It was found necessary to run the discharge pipe back that distance in order to prevent the muck from flowing back into the canal.

During the early stages of this construction when a shorter length of land discharge line was used, about 700 linear feet of muck that had been piled up along the "shoulder" dropped back into the canal when the adjoining root mat could not sustain the concentrated weight. At another time a strong wind from the north produced a low tide which lowered the water about 6½ feet, and the root mat with it, causing the muck recently pumped out to flow back again into the canal, resulting in the loss of nearly a month's work. Conversely, when the wind was from the south, great quantities of water would be blown in from Albemarle Sound to cover the old road.

The No. 3 Hydraulic Dredge

The No. 3 hydraulic dredge, built in 1927, has a wood hull, 110 x 34 x 7½ feet, made of 4-inch planks and 1-inch sheeting, and is operated by a 400-hp converted Y-type 6-cylinder Fairbanks-Morse diesel engine located near the stern. Forward of the engine and directly connected to it is a 16-inch heavy-duty Ellicott centrifugal pump with a speed of 257 rpm. The intake pipe forward of the pump is 18 inches in diameter and descends a 48-foot ladder supported by a 35-foot A-frame.

Auxiliary power is furnished by a 180-hp Y-type Fairbanks-Morse 3-cylinder diesel engine which drives a 125-kw generator. The dredge has a heavy-duty Ellicott 48-inch-diameter cutter head which can dig to a depth of 36 feet, and is driven through a 6-inch shaft by a 100-hp G-E electric motor located on the deck near the end of the ladder. A manhole is provided in front of the 3-vane 68½-inch-diameter impeller through which any pieces of root mat or other heavy material can be removed. The 16-inch discharge pipe leaves the pump at a right angle and continues down the port side of the deck to the stern where it joins the floating line.

The two stern spuds are in outside wells and are cylinders, 28 inches in diameter and 72 feet long, made of ¾-inch steel plates. The port spud is the digging spud and the starboard is the walking spud. Across the deck in line near the bow is a 5-drum battery of hoists. The two outside hoists actuate the rear spuds; the next inner two carry 400 feet of cable which runs down the ladder to the rear of the cutter head and then over to the shore where the ends are fastened to deadmen or trees, permitting the dredge to swing from side to side to make its complete cut; and the middle hoist raises or lowers the ladder. The average suction on the line was 4 to 5 inches of vacuum, while the normal discharge pressure was around 25 pounds.

The floating line was from 400 to 500 feet long, made up of 40 and 60-foot lengths of 16-inch pipe supported on cylindrical pontoons 20 feet long and with diameters of 30, 36, and 48 inches. With the 40-foot lengths of pipe a pontoon was placed 10 feet from each end, while with the 60-foot lengths the pontoons were placed 15 feet from each end. The floating line was connected with flexible rubber joints. The 200 feet of shore line was composed of 16-foot lengths of 16-inch pipe with male and female connections, and secured with wire wound around the lugs.

C. & E. M. Photo

The 16-inch discharge line from the Blue Heron was carried over the fill on a trestle so that bleeder holes near the end would deliver more solid material to the fill.

On top of each pontoon a wooden saddle block was secured by four 42-inch bolts, two on a side, threaded through 2 x 2-inch angles welded to the side of the pontoon. The floating dredge line in turn was wired to these saddle blocks.

A crew of twelve men, including those assigned to the land line, operate the No. 3, working a 12-hour shift, with quarters aboard the dredge. Joe Jordan is Captain of the No. 3.

Sand Fill

As the No. 3 dredge removed the muck and made a water-filled canal, sand was pumped into this big ditch by the 16-inch diesel hydraulic dredge Blue Heron, which tried to keep the outlet of its discharge pipe about 500 feet in back of the No. 3 so that as the muck went out the firm sand flowed in to take its place. Because of the varying speeds of the two dredges with different kinds of material, this ideal spacing was not always attained.

A desirable quality of sand for the fill was taken from a downstream borrow pit along the east bank of the river at Hospital Point south of the western end of the job. Sand was reached in this water borrow at an elevation of minus 4, and extended to a depth of minus 22 where a layer of clay was encountered. The sand was pumped from 4,000 to 6,000 feet. At the eastern end of the project an excellent source of sand borrow was obtained with the purchase of 5 acres of pecan orchard

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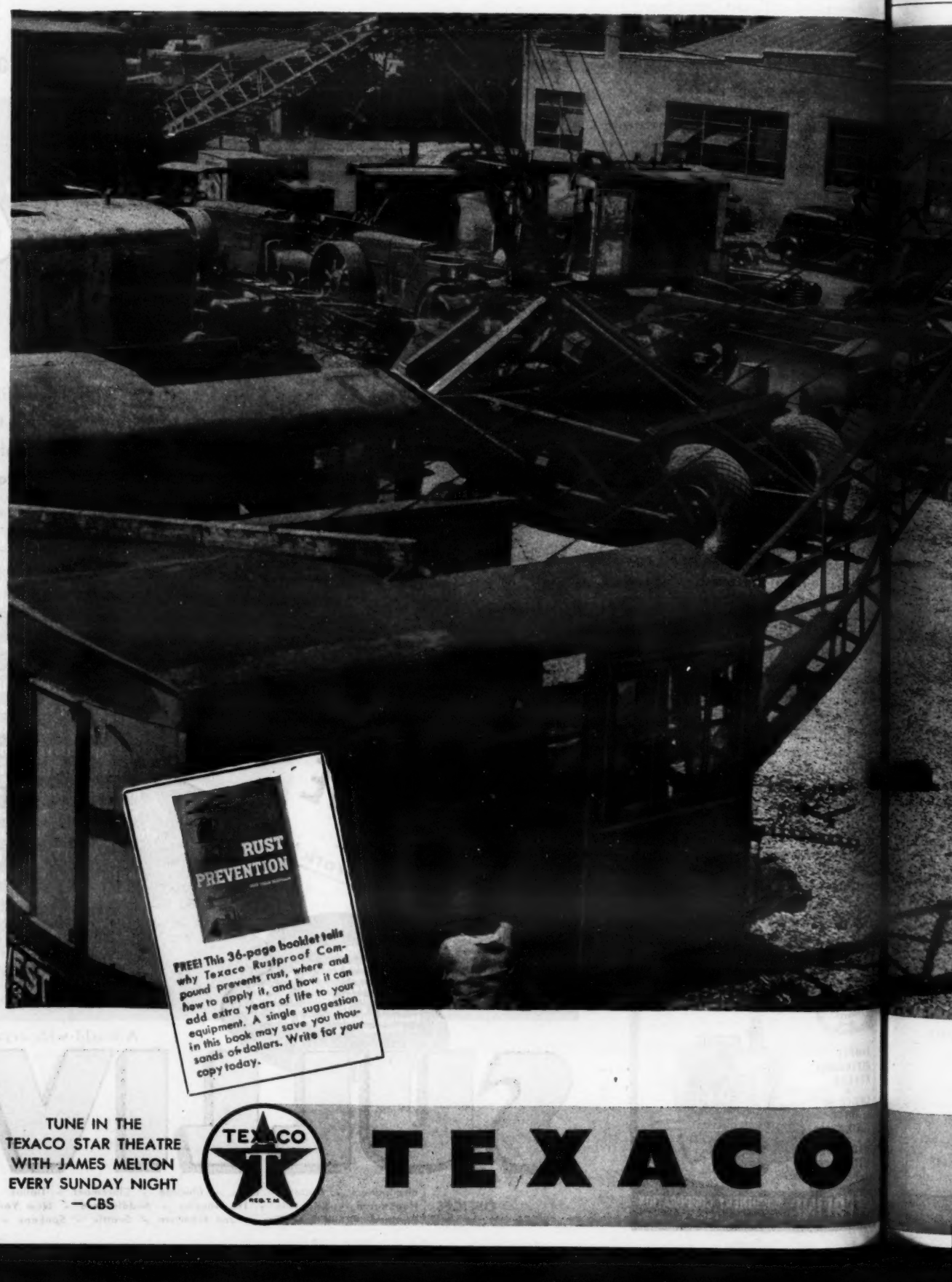
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New Hood Protection Against Paint or Dust

A new line of full-vision respirator hoods designed to provide complete protection on operations involving fine dusts, such as cement, or paint spray has been announced by the Industrial Products Co., 2914 No. 4th St., Philadelphia 33, Pa. The plastic windows are approximately 5 x 9 inches, of a new-design assembly allowing full unobstructed vision in all directions. Made of heavy gage for impact resistance, these windows are quickly and easily replaced when necessary.

Ipco hoods are available in several types. The GA-200, of heavy-duty Army duck, is recommended for short-period use where the dust volume is so great as to make breathing impossible for any length of time without some air-filtering device. It extends down over the shoulders and fastens under the arm pits. The GB-200, for long-period operations where the concentration of dust is not so heavy, is slightly

One of the new Ipco hood respirators to provide protection to workers on dusty or paint-spraying jobs.

different in design, extending just below the shoulders, and is fitted with a ventilation flap at the back. The GB-55 is similar to the GB-200 except that it is fitted with a respirator adaptable for paint spray and general nuisance dusts. There is also the AR-55, for fine dusts or paint spray, which weighs only 9 ounces, and is made of good-quality closely woven cotton cloth. It extends down to the shoulders and is provided with a draw string for pulling in at the neck.

Copies of a new 4-page folder describing and illustrating this new line of respirator hoods are yours for the asking. Just address your requests to the manufacturer and mention this item.

Southeastern Sales Mgr. For Osgood-General Cos.

R. S. (Jack) Rheay, highway and construction engineer, has been appointed Division Sales Manager for Southeastern United States by the Osgood Co. and the General Excavator Co., affiliated shovel and crane manufacturers of Marion, Ohio. Mr. Rheay formerly handled southeastern sales for the Wheeling Corrugated Co. of Wheeling, W. Va., and prior to that was Equipment Engineer for the Alabama State Highway Department.

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Rustproof Compound

Swamp Road Built

(*Continued from preceding page*)

bordering on the upstream arm of the Pasquotank. Here the Blue Heron cut into the bank, which was 8 feet above the water, and worked a 30-foot face into a wide bay north of the road. Later an 8-acre tract of pine grove was acquired on the south side of the road. The Blue Heron cut a channel through the existing road to gain access to this grove. A barge with a temporary bridge built on its deck was floated into place immediately after the dredge, and ramps placed from the road to the barge to serve as a temporary crossing for traffic while this pit was being used. This channel was filled in by the dredge when it had finished pumping from the pit. From 3,000 to 7,000 feet of line was required from this pit.

The Blue Heron

The Blue Heron used in pumping the sand fill was built in 1926 and has a wooden hull, made from 4-inch planks and 1-inch sheeting, 110 x 32 x 6½ feet. At the stern amidships is the main engine, a Fairbanks-Morse 6-cylinder 600-hp diesel, which is directly connected forward to a 16-inch pump with a 3-vane 52-inch impeller, 12 inches between the shrouds, and with a speed of 400 rpm. Located behind the main engine is an auxiliary Fairbanks-Morse Y-type 80-hp diesel engine, while to the starboard is a Caterpillar D17000 diesel. These drive 60-kw and 140-kw generators connected to one switchboard.

Originally the Blue Heron had a 68-foot ladder which could dig to a depth of 42 feet. This ladder was shortened to 42 feet so it could dig more efficiently in shallower depths not over 28 feet. A 35-foot A-frame supports the ladder, which carries the 20-inch suction pipe, and at the end of which is a 44-inch-diameter cutter driven by a G-E 100-hp motor. A depth gage up the center of the A-frame shows the operator at what depth the cutter head is working. When clay was noticed coming out of the discharge pipe, an inspector called the dredge operator on the telephone line and the cutter head was lifted and moved to another location.

Gages in the control house showed a suction vacuum ranging from 6 to 10 inches with the pressure in back of the pump varying from 40 to 50 pounds when about 4,000 feet of both floating and shore line were in use. The pump has manholes in front and back for removing foreign material. A Yale 1-ton hoist permits the quick raising of the manhole lids.

The spuds on the Blue Heron are similar to those on the No. 3 dredge and it also has five hoisting drums, of Ellicott make, operated by a G-E 40-hp motor. The hoists are hydraulically controlled with a Worthington pump driven by a G-E 5-hp motor.

The 16-inch discharge line leaves the dredge on the port side for the floating and land lines which are similar to those on the No. 3. When the dredge has good material to dig, the per cent of solids in the line reaches as high as 25 per cent. The Blue Heron, in command of Captain Willis Lindsay, works three 8-hour shifts with an average of fifteen men on a shift.

Other floating equipment used on the job included two launches, each driven by a Caterpillar D8800 diesel engine, the 42-foot J.L.D. and the 44-foot Warhorse; two similar derrick barges with wooden hulls, 42 x 20 x 6 feet, on which are mounted A-frames capable of lifting 7 tons with a 3-drum LeRoi-powered hoist; and two wooden-hull pipe barges, 100 x 30 x 7 feet.

Building the Fill

At the end of the discharge line a

(*Concluded on next page*)

Swamp Road Built

(*Continued from preceding page*)

2 x 4-foot metal "spoon" was fastened to the pipe so that the hydraulic fill hit this as it gushed from the line and dropped immediately to the fresh fill, thus being spread more evenly. As the fill built up, the land line was advanced on a wooden trestle, keeping the pipe always above the fill so that the bleeder holes could function. In the bottom of each 16-foot length of pipe were two 4 x 16-inch holes which could be opened or closed by manually operated shutters. For the final 400 feet from the end of the discharge these bleeder holes were used to put the more solid material on the fill, and let most of the water pass out the discharge end of the pipe and into the canal. As much as 50 per cent solid material was discharged from these bleeder holes and prevented the water from eroding the growing fill. The water in the material being pumped had a velocity about three times as great as the sand. Consequently the sand dropped to the invert of the pipe line while the water rushed through the upper part.

Ordinarily this kind of hydraulic fill builds up on a very flat 15:1 slope. To check this and save material, the contractor placed metal baffle plates 10 feet long x 2 feet high along the discharge line. These were moved about as needed and kept the fill to a 5:1 slope as the design of the road intended.

At one section, where the new fill closely parallels the existing road, the construction plans called for building a detour over the swamp as the hydraulic fill would pour over and block the old causeway. The contractor avoided building a costly and difficult swamp road by erecting a wooden barricade 2,300 feet long along the edge of the old highway which prevented the fresh fill from blocking traffic. Posts about 10 feet long x 4 inches in diameter were set every 8 feet to which were nailed 1 x 12-inch boards 14 feet long to provide a fence averaging 4 feet in height above the level of the swamp.

When the hydraulic fill is completed, the wooden trestle which supported the discharge pipe will be removed and the roadway area shaped up by tractors and graders and the asphalt pavement put on. The banks along the borrow pits were trimmed and smoothed by a Northwest ½-yard dragline on a 40-foot boom.

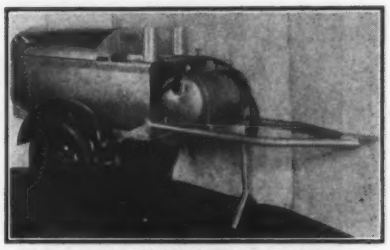
The new fill bridges the swamp from the firm ground of the pecan orchard on the east cross 2⅓ miles of waste to within 210 feet of the Pasquotank River bridge which leads into Elizabeth City at the west end of the project. The last 210 feet, which is also over swamp, will be constructed under a separate contract with a concrete superstructure resting on piles. Hydraulic-fill construction at this point would require the acquisition of too much right-of-way around the bridge approach, and would also impede traffic more than would the causeway section.

Personnel

This grading contract is expected to be completed this month. N. W. Berger, Vice President and District Manager of the R. C. Huffman Construction Corp., directed the contractor's operations, with W. J. Rae as Superintendent. W. S. Winslow is Hydrographic Engineer for the North Carolina State Highway and Public Works Commission, of which W. Vance Baise is State Highway Engineer. The road is located in Division 1 of which J. C. Gardner is Division Engineer, with W. J. Overman Resident Engineer on the project.

New Asphalt Kettle Has Many Features

A number of improvements have been included in the new Aeroil Heet-Master high-speed pneumatic-tired trailer-type asphalt heating kettle which is now in production by the Aeroil Products Co., 5775 Park Ave., West New York, N. J., for peacetime construction and maintenance jobs. One of its features is the location of the oil burner inside the kettle, eliminating waste heat, lowering fuel cost, and making it cool for the workmen working around it. The tube heating unit can be quickly and easily removed for cleaning purposes.



The new Aeroil Heet-Master kettle now available for civilian use.

These Heet-Master kettles come in several sizes, ranging from 30 up to 165-gallon liquid capacities in steel-wheel and skid-mounted models, and in four sizes of pneumatic-tired units, 55, 80, 110, and 165-gallon capacities. All three models in larger gallon capacities will be offered early in the post-war period.

The Aeroil Products Co., formerly known as the Aeroil Burner Co., which maintains branch offices and warehouses in San Francisco, Chicago, and Dallas, will be glad to send copies of its new Leaflets 260P and 260R containing further information on the Heet-Master. Just mention this item.

Two Staff Appointments At Homestead Valve Co.

By action of the Board of Directors of the Homestead Valve Mfg. Co., Coraopolis, Pa., Don H. Krey and Elliott G. Johnson have been appointed to the posts of General Sales Manager and Assistant General Sales Manager. Mr. Krey will direct sales of valves and Hypressure Jenny steam cleaners and cleaning compound. Mr. Johnson will supervise all valve sales activities while retaining his duties as Director of Advertising and Public Relations.

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BECAUSE MIR-O-COL Hard-Facing alloys flow readily when correct welding heat is applied, penetration of the parent metal at the interface averages about .0007 of an inch. Dilution is minimized, as the photo-micrograph (above) shows. The consulting metallurgist who prepared this impartial study of MIR-O-COL No. 2 hard-facing, states that the ferritic grain structure of the hard-facing (light area above) consists of cementite and martensite . . . which combine to give MIR-O-COL alloys their hardness. This hardness, fused at the moment of impingement of either electric or acetylene torch, can form a protective layer of high-alloy metal over wearing surfaces of your equipment. Scrapers, cutters, material-handling rollers and buckets—in fact, almost any type of apparatus or equipment subjected to constant wear from abrasion, erosion or corrosion—can be economically hard-faced. In almost every recorded instance, maintenance costs have dropped, production records gone up, and equipment capitalization minimized by using this dollar-saving MIR-O-COL Hard-Facing, applied easily to iron or steel. Learn more about hard-facing for profit. Write today for your FREE copy of "Weldors' Guide to Successful Hard-Facing." Address Department B-18.

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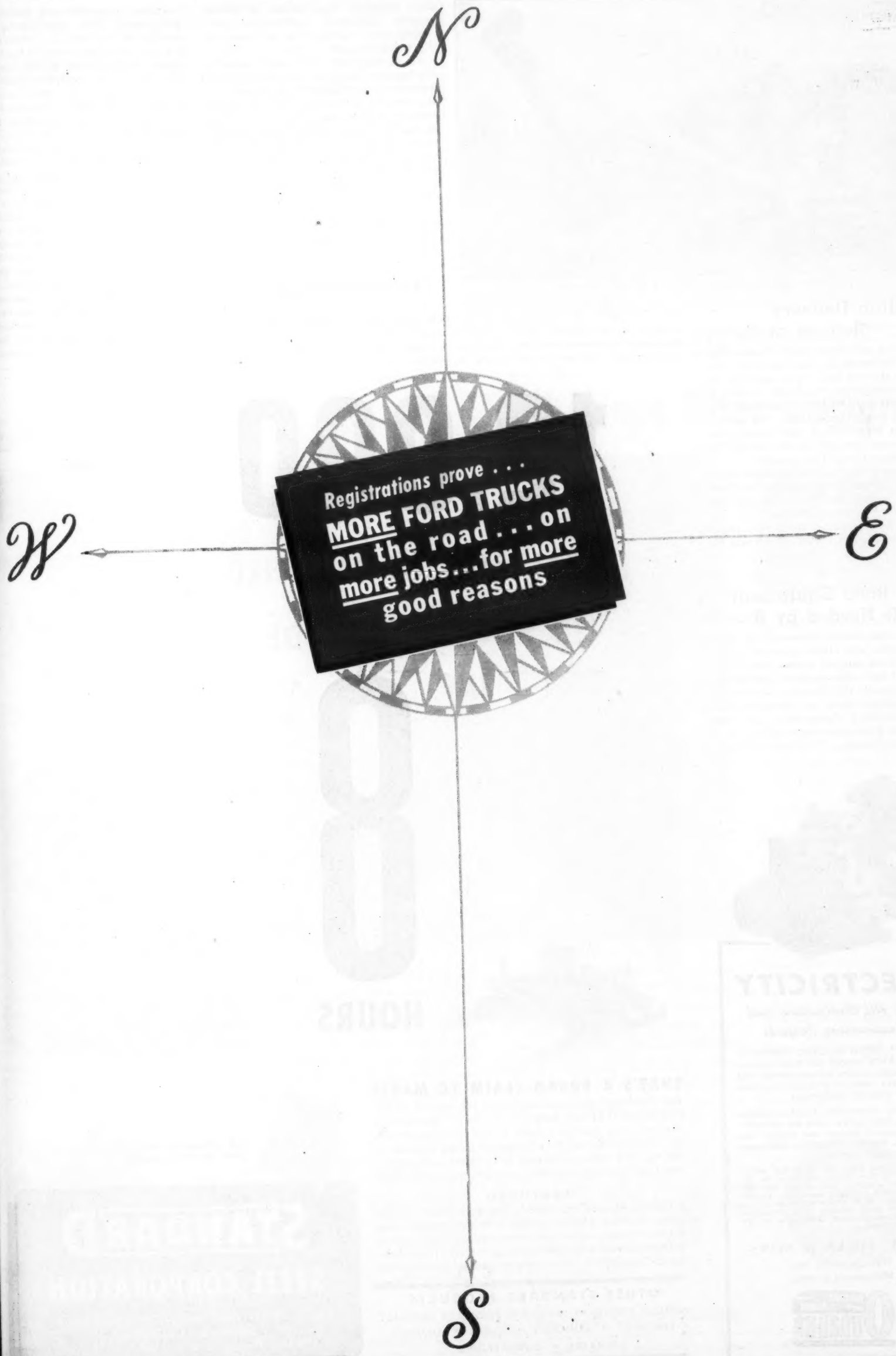
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MORE FORD TRUCKS
on the road . . . on
more jobs . . . for more
good reasons

The first Insley excavator to go to a civilian since 1942.

Civilian Delivery Returns at Insley

For the past three years, Insley Mfg. Corp., Indianapolis, Ind., has been producing shovels and cranes entirely for the armed forces, but early in July it delivered the first Insley excavator to a civilian buyer since 1942. The unit, a ½-yard Model K-12 with trench-hoe attachment, was sold to the Jacob Day Excavating Co. of Indianapolis.

George J. Dimond, Insley Sales Manager, is shown on the right in the illustration, with Jacob Day in the cab, and Jack Hunt of Reid-Holcomb Co., Indianapolis distributor for Insley products throughout Indiana, who made the sale.

U. S. Road Equipment Is Needed by Brazil

More than $5,000,000 worth of tractors, trucks, and other highway equipment will be shipped to the state of Sao Paulo, Brazil, alone as soon as possible, Senor Carlos da Silveira Lichtenfels told representatives of the American Road Builders' Association and the Office of Inter-American Affairs at a recent conference. This Brazilian highway engineer is spending several months in the United States, visiting American plants producing highway construction machinery and calling on state highway departments to study modern planning, construction, and maintenance methods as practised in the United States.

Sr. Lichtenfels, who until recently has been in charge of the planning and location of the mountain section of the Via Anchieta uniting the Brazilian coffee port of Santos with the industrial city of Sao Paulo, painted an optimistic picture of post-war highway construction in South America and referred to the admiration of Latin American engineers for United States machinery and methods.

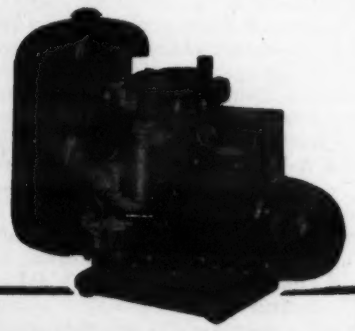
An article outlining Brazil's National Highway Plan and the various projects scheduled for post-war construction appears on the opposite page.

Hard-Surfacing Rod

A new heavy coated hard-surfacing electrode, said to produce a hard alloy-steel weld with the ease and smoothness of operation of a mild-steel rod, has recently been put on the market. This Tufanhard electrode can make welds continuously with overlapping beads without the necessity of removing the slag, and the deposit can be heated and drawn to any temper within the range of the type of rod used. Low spatter loss and smoothness of bead minimize grinding in finishing, thus making it economical to use, according to the manufacturer.

Suitable for use in all positions, the Tufanhard electrode will operate on either alternating or direct current although straight polarity is recommended when using dc. Tufanhard is made in 14-inch lengths, in 1/8, 5/32, 3/16 and 1/4-inch sizes, and is packed in 5-pound and 25-pound cartons. Three grades are available, designated as 600, 400, and 250, corresponding with the Brinnel hardness of the deposited metal.

Complete information regarding this new electrode will be furnished to readers who write directly to the Electrode Division, Hobart Brothers Co., Troy 1, Ohio, and mention CONTRACTORS AND ENGINEERS MONTHLY.



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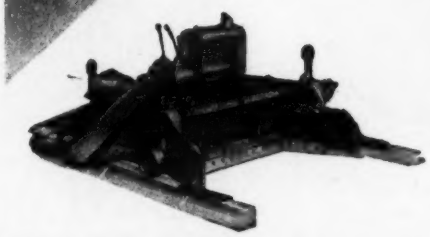

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But it's based on fact—an actual job record of the STANDARD-LEWIS Subgrader on four 25-foot runways that had to be built in a hurry. In this speedy operation, the STANDARD-LEWIS Subgrader bailed material at the rate of 8 yards per minute and produced a finely finished and accurate subgrade from side form to side form.

FEATURES

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Brazil Road Program Ambitious, Farsighted

Largest South American Republic Has Complete National Highway Plan: Will Need U. S. Equipment

By MAURICE E. GILMORE, Director of Overland Transportation, Transportation Department, Office of Inter-American Affairs

BRAZIL is planning, and beginning to carry out, an elaborate long-range program which promises to have significant effects in the field of international trade, no less than in the enhancement of the republic's economic progress and the general well-being of the Brazilian people. Commercial transformations, the rise of new and important markets and sources of supply loom now as probable results of the eventual construction of the highway networks which are envisaged.

As a shorter-term consequence, with victory, Brazil will be in the market for a vast amount of road-building machinery and tools, as well as a large corps of trained highway engineers. U. S. manufacturers should obviously be in an excellent position, now that exigent requirements of wartime are subsiding, to provide the tools and mechanical equipment that the big Brazilian highway program will demand. As regards the engineering, the Brazilians have great actual and potential capabilities, and already a number of young Brazilian highway engineers have come to the United States for advanced training in modern road-building.

Present Highway System

Brazil, the largest of the American republics, exceeding even the United States without Alaska, has been sorely handicapped in the past by a lack of adequate highway transportation. Most of its highway development has taken place within the past twenty years, so that today this republic has an estimated 258,390 kilometers (a kilometer equals 0.6214 mile) of highways of various types being used by nearly 243,000 motor vehicles, plus thousands of ox carts and other forms of local transportation.

These highways are classified as follows:

Type	Kilometers
Concrete	371
Asphalt	207
Bituminous macadam	2,264
Broken stone	8,622
Improved dirt	52,831
Unimproved dirt	194,094

In other words, less than 25 per cent of the roads are improved.

Exigent Need for Roads

As recently as 1940, 80 per cent of the nation's highways were without drainage and in poor condition, so that in the rainy season many were obstructed or impassable. To this may be added the fact that the majority of vehicles using these roads, trucks, buses and motor cars, were built for first-class roads or for use on city streets, which added greatly to repair and maintenance charges on the vehicles in use.

With a view to overcoming these difficulties and to provide a unified plan for construction and maintenance, a National Highway Plan was drawn up and approved by Presidential decree in March, 1944, calling for the construction of 35,906 kilometers of first-class and 2,631 kilometers of second-class roads.

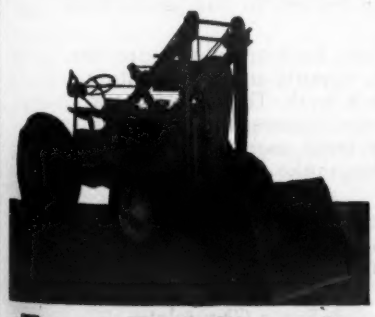
In drawing up this program, the following factors were taken into consideration:

1. To prevent the new highways, insofar as possible, from competing with existing railways, and thus avoid duplication of service;
2. To make use of existing highways or those projected by the various state highway authorities;
3. To consider only those highways of national significance;
4. To see that the highways in the

(*Continued on next page*)

C. I. A. A. Photo

Modern road-building machinery aids in grading a section of the new expressway between Santos and Sao Paulo in Brazil. The Brazilian National Highway Plan will require much more U. S. road equipment as wartime restrictions are lifted.



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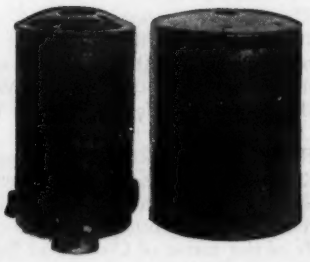
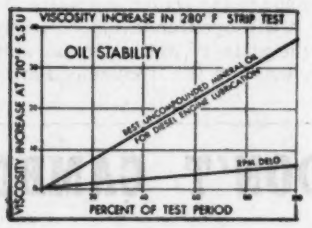
How RPM DELO OIL stops filter clogging



Powerful Anti-Oxidant effects of compounding material in RPM DELO Oil are graphically illustrated by cleanliness of this filter after 500-hour test under heavy duty conditions. Inherent stability of selected base stocks in RPM DELO Oil, plus detergent compounds assure minimum engine deposits, prevention of many costly shutdowns.


VISCOSITY INCREASE IN 280° F STRIP TEST
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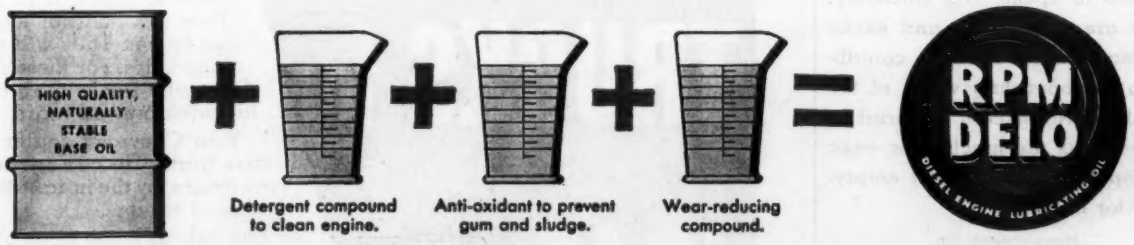
VISCOSITY INCREASE AT 210° F S.S.U.
BEST UNCOMPOUNDED MINERAL OIL FOR DIESEL ENGINE LUBRICATION
RPM DELO
PERCENT OF TEST PERIOD

This Is How uncompounded oil clogged a regular commercial filter element after only 204 hours in a test run. The shiny sludge deposit is the result of oxidation of oil, plus iron, silica and water. In actual use, a clogged filter can result in stopped-up oil passages and excessive crankcase sludge, necessitating expensive overhauls for cleaning.

Same Type Filter from the same engine, operated on RPM DELO Diesel engine lubricating oil looked like this after 1234 hours. There is little deposit, oil flow is unimpaired. RPM DELO Oil prevents filter clogging two ways: 1. By maintaining piston rings in free working condition. 2. By minimizing oxidation of oil itself.

How RPM DELO Oil resists oxidation far more effectively than other oils is shown in this chart. Results were based upon increase of viscosity during severe laboratory tests. Write Dept. T-X, Standard of California, San Francisco 20, Calif., for more technical information on RPM DELO Diesel Engine Lubricating Oil.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RPM DELO Oil has world-wide distribution under the names: RPM DELO, Caltex RPM DELO, Signal RPM DELO, Imperial RPM DELO (CONCENTRATE)

Brazil Road Program Ambitious, Farsighted

(*Continued from preceding page*)

interior of the country connect at suitable points with the commercial air lines.

The plan visualizes a structure composed of three groups of highways. These comprise longitudinal highways running north and south, transverse highways from east to west, and connecting highways between important points or between two or more trunk highways. This plan provides for a complete network, eventually, throughout the republic.

Principal Roads Planned

The principal grand trunk road of this network, as planned, will be the Getulio Vargas Highway (6,155 kilometers) which roughly will follow the coastal region throughout from Belem on the Amazon in northern Brazil to Jaguarao on the border of Uruguay, uniting Belem with the capitals of the northern states and passing through Rio de Janeiro, Sao Paulo, Curitiba, Porto Alegre, and Pelotas.

The Pan-Northeastern Route, of 3,087 kilometers, will join all the state capitals of the northeast including Sao Luis, Fortaleza, Natal, Recife, Maceio, and Salvador, besides many other towns en route.

Route No. 3, the Trans-Northeastern (1,275 kilometers), whose construction is already far advanced, will establish direct communication between the capitals of the states of Ceara and Baia. It will serve as the main trunk line of the northeast, and from it will extend branch lines to the other capitals.

The Trans-Brazilian Highway, Route 4, of 4,915 kilometers, running through the central meridian of the nation, will extend from Belem on the Amazon to Santana do Livramento on the border of Uruguay, and will unite remote points hitherto without adequate communications.

Route No. 5, the Amazonian Highway (2,946 kilometers) will run from Santarem, halfway between Belem and Manaus to the center and south of Brazil. It will open undeveloped territories in the state of Matto Grosso and will terminate on the frontier of Parana.

C. I. A. A. Photo
Workmen lay crushed-rock base on the new expressway under construction between Santos and Sao Paulo, Brazil.

The Acre Highway, Route No. 6 (2,814 kilometers), will unite the Acre Territory in the northwest with the center and south of the country.

Fifteen transverse highways, Routes No. 7-21, totaling 14,291 kilometers, will provide communications across the country between major points, while six connecting highways, amounting to 3,184 kilometers, will complete the system.

Army's Big Role

Particularly noteworthy in this construction program is the important role played by Brazil's Army in building and improving highways. Within a recent four-year period the Army Highway Battalions have either surfaced or completely constructed more than 3,000 kilometers of important highways and are currently engaged on survey and construction assignments totaling several thousand kilometers.

Of the highway work thus far completed by the Army, 1,600 kilometers lie in the three southern states of Parana, Santa Catarina, and Rio Grande do Sul. In the great undeveloped Matto Grosso region, the "Wild West" of Brazil, the Army has done useful work in surveying and opening up new highways and in making passable many existing trails. This includes the complete rebuilding of the important 850-kilometer highway extending from Campo Grande, on the Northwestern Railway, northward to Cuiaba, the capital of Matto Grosso. Another important highway built by the Army in this territory is that starting from the town of Aquidauana on the same Northwest-

(*Concluded on next page, Col. 2*)

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Your Chevrolet dealer can supply the right truck for your trade. He can increase the payload capacity, if you desire, by the installation of auxiliary axles, springs, bodies or trailers.

Buy only as much truck as you need. Buy a Chevrolet truck. It's payload, not chassis weight, that pays profits.

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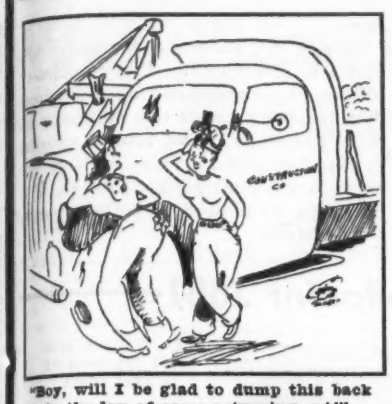


"Boy, will I be glad to dump this back in the lap of some returning vet!"

In What Order Will Your Jobs Be Built?

The greatest responsibility of every engineer in public employment today is to hasten the completion of an adequate stock of finished plans for post-war construction. This applies in every field of public works, but particularly in the highway field for which Federal Aid is available.

Authorities agree that if $1,000,000,000 in construction work is proposed, there should be at least twice that amount in plans in order to give flexibility to the program. With a choice available, the jobs can be started where the demand for employment is greatest. If we have plans for a road at Smithville and for another at Jonesburg, but at Smithville there is no unemployment while at Jonesburg men are idle and hungry, it is natural that the Jonesburg project should be the first to be built. The Smithville job can come later, but if the Smithville job is the only job for which we have planned, we face a truly grave situation. So let's plan both jobs.

When you have completed double the stock of plans which you feel will really be needed for immediate construction, then you can give very serious consideration to their priority of construction. Out in Topeka, Kans., they have an extensive list of post-war projects for the administrative, water, street, and park departments. Complete details have been prepared for seventy-six projects, including cost, method and status of financing, how plans are to be prepared and time required, legal preparation, right-of-way, employment, and legal authority.

Then they established seven basic principles as an aid to determining the priority of individual projects. These priorities should help you in coordinating your operations. They are:

1. In the field of financing, the bonded indebtedness for construction projects is not to be increased by more than $750,000 in the first year after the war, and by an additional $500,000 in the second year.
2. With the exception of public roads funds, Federal funds will not be accepted, except for an extreme emergency.
3. Modern equipment should be used on all construction jobs in preference to made-work by hand labor.
4. The time of starting any construction work will be determined first by the need of taking care of unemployment, and second when the particular construction is necessary without reference to unemployment.
5. The order in which the projects are commenced will be determined first, by the need of the project, and second, by the readiness of the project.
6. As to financing, preference is to be given, first, to the project that is financed by cash; second, to the project financed by bond issue; third, to the project requiring bond issue and election.
7. In the case of a project involving a benefit district, preference will be given to those projects covering a district in which 90 per cent of the taxes are paid up.

Brazil Road Program Ambitious, Farsighted

(*Continued from preceding page*)

ern Railway (west of Campo Grande) and extending southwestward to Porto Murtinho on the Paraguay River.

Surveys have been completed for a 220-kilometer road westward from Cuiaba to Sao Luis de Caceres on the upper Paraguay River. The Army has begun work on a highway to run northwestward from Cuiaba following the old overland trail across Matto Grosso to Porto Velho on the Madeira River, in northwestern Brazil. This route has been surveyed for some 600 kilometers, and completed for over 100 kilometers.

Salient Examples

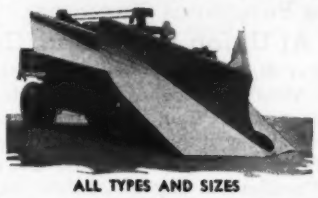
Worthy of special mention are two outstanding pieces of highway construction now under way in Brazil. One is the 485-kilometer express highway between Rio de Janeiro and Sao Paulo and the 76-kilometer express highway between the port of Santos and the city of Sao Paulo.

The Rio-Sao Paulo expressway will have two asphalt-surfaced roadways each 25 feet wide, with a 10-foot landscaped strip in the center. The Santos-Sao Paulo Highway, officially known as the Via Anchieta, is a dual concrete-surfaced highway, each roadway 20 feet wide, and with an 18-foot dirt service road on either side for most of its length. Several kilometers of this highway are already open for use, and all of it would have been completed by this time had not war-caused scarcities prevented road-building machinery from arriving from the United States.

From a recent issue of *Foreign Commerce Weekly*.

Many people want freedom for themselves, but regulation for the other fellow.

It Still Pays to ORDER EARLY



ALL TYPES AND SIZES

DAVENPORT-FRINK SNO-PLOWS

We are now building Sno-Plows to meet the demands for the coming snow season and hope to be able to meet the requirements of all of our customers. However, we must caution that production cannot be unlimited under present conditions and we again urge the early placement of orders to insure deliveries in time to meet the emergencies of the coming winter. Our fullest cooperation will be extended at all times.

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MANUFACTURER of FULL METALLIC, SEMI-METALLIC, WOVEN and MOLDED FRICTION MATERIALS.

A feature of the new Kwik-Mix Dandie 16-S mixer is its tilted flow-line discharge chute. Its four-wheel mounting may be steel wheels or pneumatic tires.

New 3-Bag Mixer

Another in the new series of Kwik-Mix Dandie concrete mixers has recently been announced. This new 16-S discharges faster, according to the manufacturer, because it is equipped with a tilted flow-line discharge chute. High-strength steel is used at all points of wear. A new selective skip shaker operates only when the skip is partially empty and ready for shaking. The drum blades are self-cleaning. The mixer is mounted on four wheels, either steel or pneumatic-tired.

Further information on this new Dandie 16-S mixer and its availability may be secured direct from the Kwik-Mix Co., Port Washington, Wis., by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

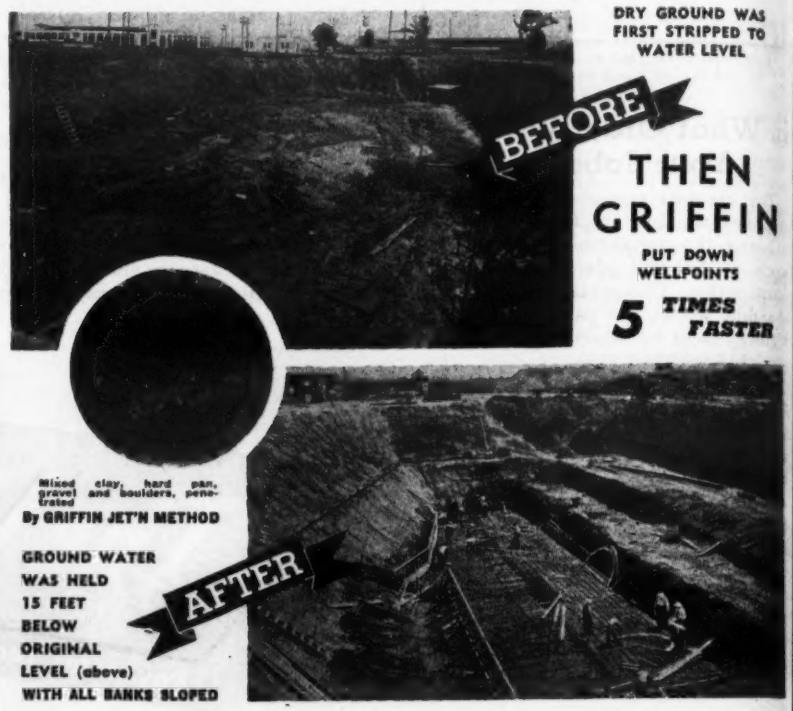
Some Personnel Changes At Union Metal Mfg. Co.

Walter H. Robertson has joined the Union Metal Mfg. Co. of Canton, Ohio, as Manager of Piling Sales and Engineering. Prior to this he was associated with Massey Concrete Products Co. as Vice President in Charge of Sales and Engineering Developments. He is a graduate of Harvard University and of Massachusetts Institute of Technology and is an Associate Member of the American Society of Civil Engineers. His headquarters will be at the company's main plant in Canton.

Cove W. Sullivan, formerly Manager of Piling Sales and Engineering, is now Manager of the New York District, handling the sale of all of the company's regular products. R. A. Weinland has been named Lake States District Manager.

Joseph A. Coblentz, formerly with McLean Contracting Co., Baltimore, Md., has been appointed Sales Engineer with headquarters in the Baltimore office. Robert M. Frost, who is assisting in expediting and priority matters, was Head of the Contract Unit for the U.S. Maritime Commission before joining Union Metal.

A Griffin Wellpoint Job!


DRY GROUND WAS FIRST STRIPPED TO WATER LEVEL
BEFORE
THEN GRIFFIN PUT DOWN WELLPOINTS 5 TIMES FASTER
Mixed clay, hard pan, gravel and boulders, penetrated By GRIFFIN JET'N METHOD
AFTER
GROUND WATER WAS HELD 15 FEET BELOW ORIGINAL LEVEL (above) WITH ALL BANKS SLOPED

A well drilling outfit was first used to install mesh covered wellpoints—and could put down only 4 wellpoints to a depth of 20 feet in 3 days. The contractor THEN used the Griffin JET'N METHOD and averaged 20 wellpoints per day without a well drilling outfit. Think of the SAVING made by using the GRIFFIN SYSTEM. Moral: Buy or Rent Griffin Wellpoints in the first place.

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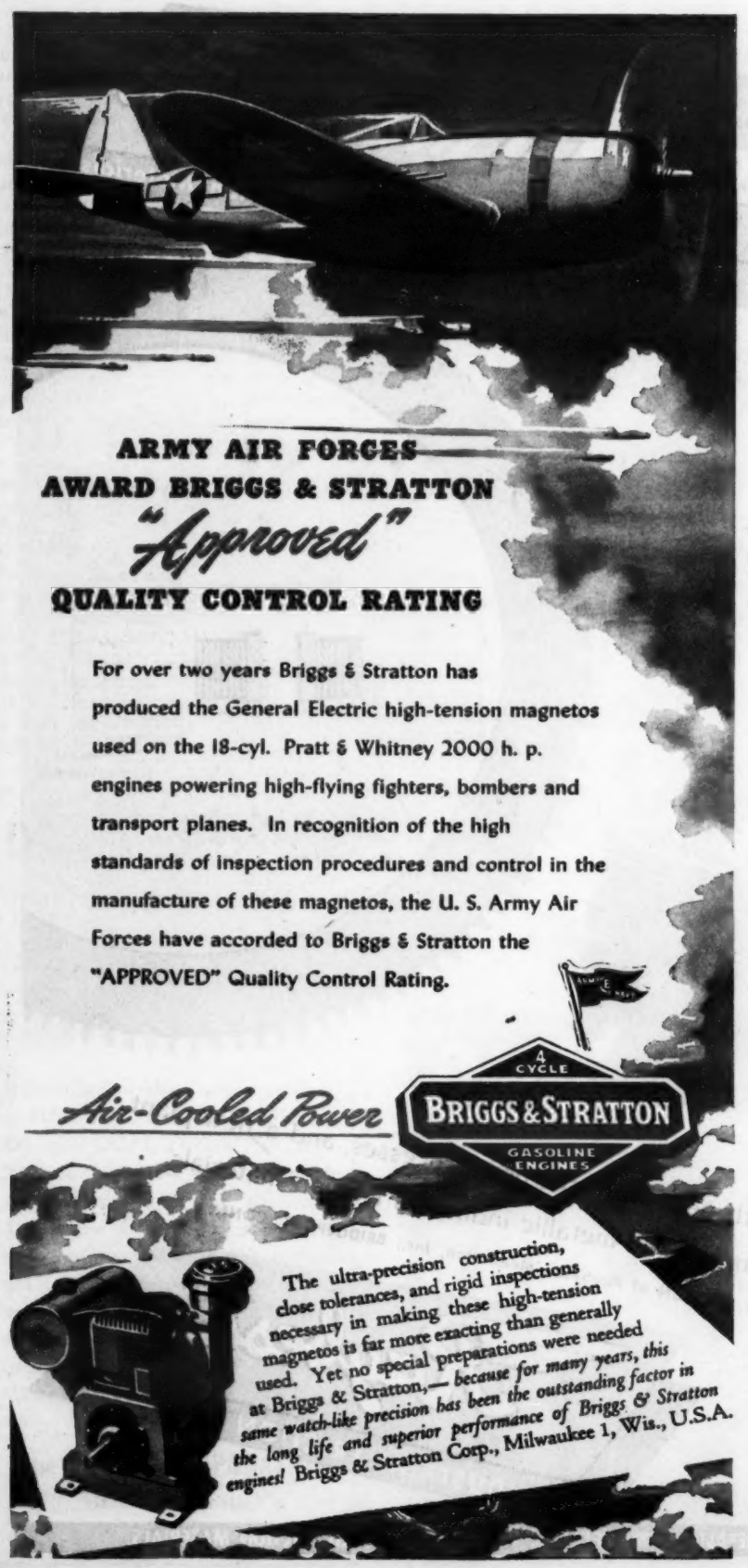
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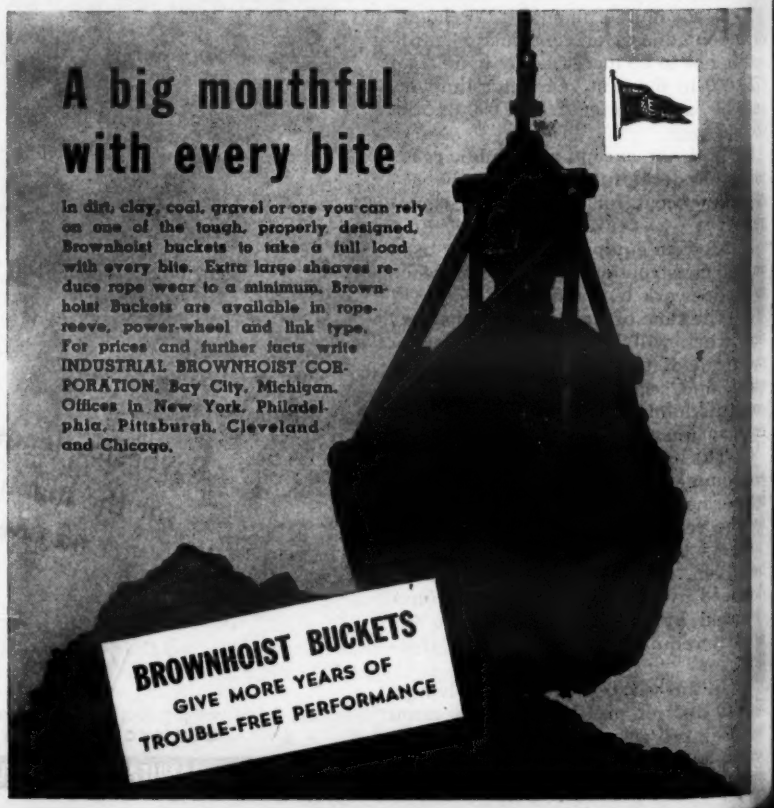
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In dirt, clay, coal, gravel or ore you can rely on one of the tough, properly designed, Brownhoist buckets to take a full load with every bite. Extra large sheaves reduce rope wear to a minimum. Brownhoist Buckets are available in rope-reeve, power-wheel and link type. For prices and further facts write INDUSTRIAL BROWNHOIST CORPORATION, Bay City, Michigan. Offices in New York, Philadelphia, Pittsburgh, Cleveland and Chicago.
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GIVE MORE YEARS OF TROUBLE-FREE PERFORMANCE

Well Planned Set-Up For Crushing Plant

Portable Plant Provides Washed, Crushed, Screened Gravel for Surfacing Job And Plant-Mix

WITH the nearest point on a railroad 18 miles away in any direction, the State Highway Department decided to wash, screen, and crush its own gravel for use in the reconstruction of two highways in northwest Alabama, thereby saving high hauling charges and eliminating the uncertainty of having enough trucks available and in condition to transport material from the distant railroad to the job locations.

Sometime this year the Department plans to lay a single bituminous surface treatment for 22 miles on State Project 479 from Hamilton east to Haleyville, for which coarse gravel will be needed as a cover coat, and also to resurface with a hot plant-mix the 14 miles on U. S. 78 from Hamilton west to the Mississippi state line, which will require a fine aggregate gravel for the wearing course.

To supply this material, a site for a gravel plant was chosen alongside a small stream on the south side of State Project 479 about 4 miles east of Hamilton. The flow of the stream is too unreliable to insure a constant supply for the washing process so an earth dam was constructed to impound the necessary water. Material with which to build the dam came from the same gravel pit which later furnished the aggregate for processing in the plant. Located about a mile south of the plant on a good sand-gravel road, the pit had an easily worked face with an average height of 18 feet. The land was owned by a farmer who sold the sand-gravel to the State by the truckload. Excavation was done by a Northwest ¾-yard shovel, and eight Ford trucks hauled the material in 3-yard dump bodies.

The trucks dumped the material for the dam near the site close to the road, and a Caterpillar D7 tractor and bulldozer pushed the gravel into position, building up an 18-foot-high earth embankment, 64 feet wide at the bottom and 12 feet wide at the top, and measuring 150 feet along the crest. The upstream side of the dam was faced with clay to make it impervious so that it would retain the 300-foot lake that was impounded behind it. An 18-inch concrete pipe through the dam carried the wash water from the gravel plant.

The Gravel Plant

While the dam was being constructed in March, the gravel plant was assembled on the sloping ground alongside the newly made lake. The trucks from the gravel pit end-dumped their material into a wooden hopper at the far end of the plant, with two laborers assisting in emptying the bodies. At the bottom of the hopper, a 6-foot belt carried the gravel to an 18-inch-wide bucket elevator, 35 feet high. The belt and elevator were operated by an Allis-Chalmers engine.

C. & E. M. Photo

This state-owned washing, screening, and crushing plant, set up alongside a small stream, produced 30,000 tons of gravel for road work in northwestern Alabama.

At the top of the bucket elevator the gravel was deposited on a 40-foot-long steel trough, welded in 10-foot sections, sloping down on an 18 per cent gradient. The trough was 20 inches wide and 6 inches high, and had steel baffle angles placed every 8 feet which served to scrub the gravel in passage. Four wooden trestle bents, 30 feet high, supported the trough. Two streams of wa-

(Concluded on next page)

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GATKE Brake Blocks and Frictions — Moulded to machined accuracy in ALL shapes and sizes — LARGE or small.

GATKE High-Heat-Resisting Brake Materials take more punishment because they are made for tough service —using materials and processes developed thru 28 years of specialization.

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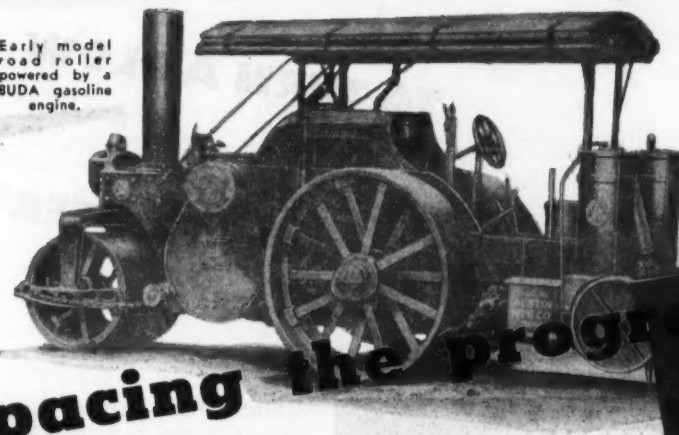

Early model road roller powered by a BUDA gasoline engine.

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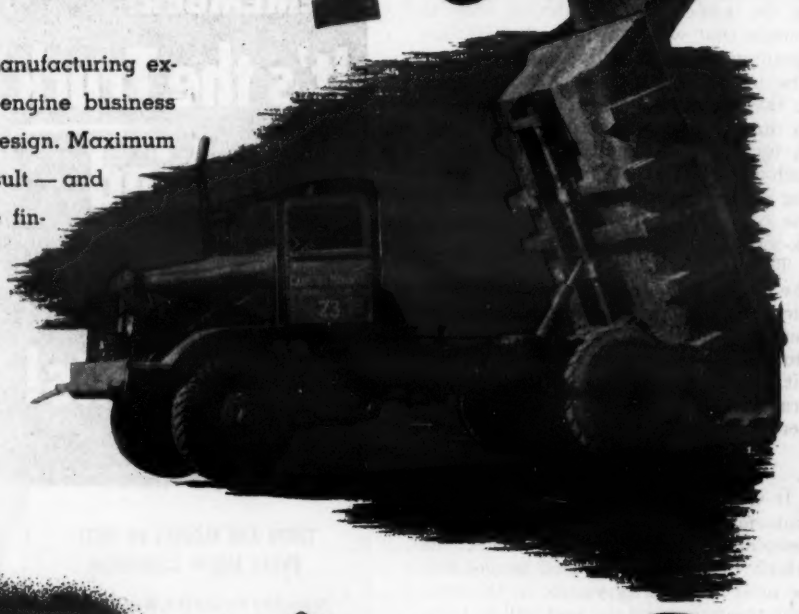

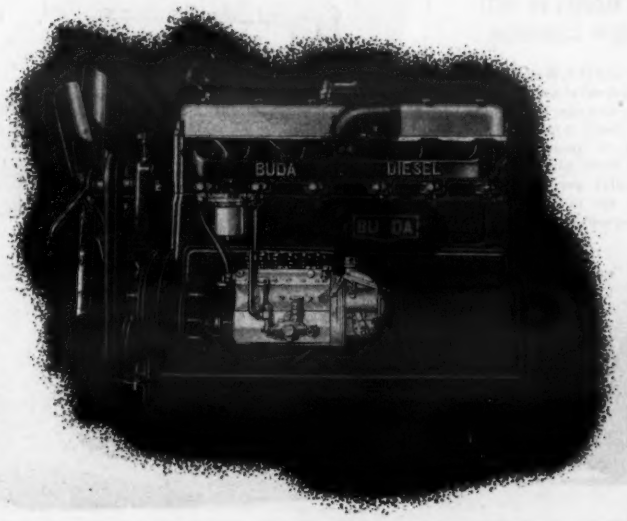

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Well Planned Set-Up For Crushing Plant

(*Continued from preceding page*)

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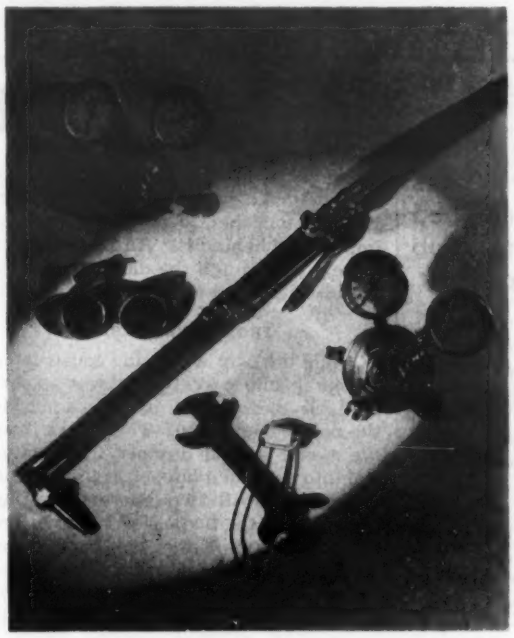

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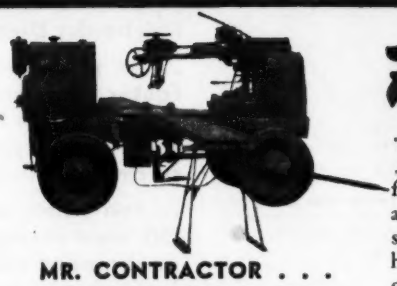

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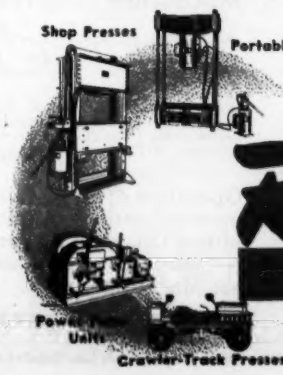

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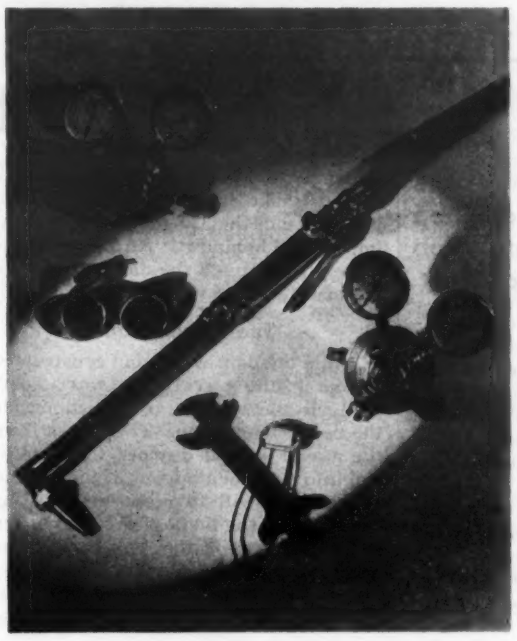

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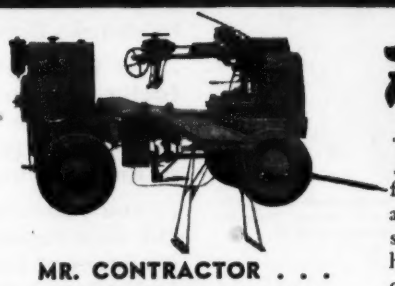

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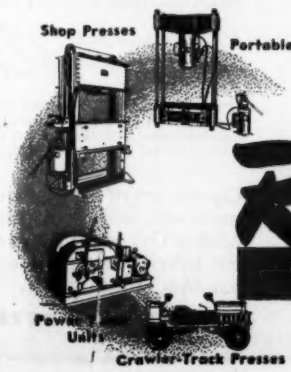

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CONTINENTAL RUBBER WORKS

ERIE, PENNSYLVANIA, U.S.A.

Secondary Highways And Their Financing

A Series of Questions and Answers Gives the Whole Picture of Federal Aid and How It Is Administered

✦ THE following questions and answers on the Federal-Aid secondary-road program and related local road problems were prepared by the County Highway Officials' Division of the American Road Builders' Association, to aid those concerned with planning for this program.

1. *When were Federal-Aid funds first used on secondary roads?*

The use of Federal funds on secondary roads first appears in the 1933 report of the Bureau of Public Roads, then in the Department of Agriculture. These were emergency funds, and such expenditures were made until the Act of June 30, 1936, when the use of Federal-Aid highway funds on a selected Federal-Aid secondary system was first authorized.

2. *What is the difference between the Federal-Aid secondary-highway authorization of 1944, and such authorizations of previous years?*

Four distinct advances have been made, all calculated to interest local road agencies in assuming their place in an overall highway construction program. First, fund authorizations have been increased to $150,000,000 per year for the first three post-war years. Second, to insure the inclusion of principal local feeder, school-bus, mail-delivery, and farm-to-market roads, the Act requires that, after its passage, all roads selected for inclusion in the Federal-Aid secondary systems must be chosen in consultation and by agreement between the state and interested local officials.

The third and fourth points of advantage to local road officials are of executive origin and character. Section 1.8 of the Public Roads Administration Regulations issued April 21, 1945, provides for the use, under state direction, "of well qualified and suitably equipped engineering organizations of counties, municipalities, or other local subdivisions for making surveys, preparing plans, specifications and estimates, and for supervising the construction of any project". The fourth point is an agreement between the Public Roads Administration and the American Association of State Highway Officials upon a broad basis of design and construction standards, which establishes minimum and desirable standards wholly consistent to the road use and potentialities. These standards are divided into three classes, one for roads of less use than 100 cars per day, one for roads having a traffic use between 100 and 400 cars per day, and one class for the more important roads carrying traffic between 400 and 1,000 cars per day.

3. *Where may I obtain copies of the PRA Regulations governing the Federal-Aid Highway Act of 1944?*

Reprints of the Regulations were sent to members of the American Road Builders' Association on May 1, 1945, but the County Highway Officials' Division still has a limited supply and a copy will be mailed on request. The state highway departments also have copies for distribution.

4. *Must Federal-Aid secondary-road funds be matched?*

Yes, on a 50-50 basis, by the state highway department. Any arrangement for local matching is left to agreement between the state and its local agencies, counties, municipalities, and towns.

5. *What does Federal Aid cover?*

With the exception of states containing public lands or Indian lands in excess of 5 per cent of the total land in the state, Federal Aid will be extended for 50 per cent of the costs of surveys, plans, engineering and economic investigations, and construction. Federal Aid to the extent of one-third of the costs of the right-of-ways is also provided.

6. *How is Federal Aid apportioned among the states?*

On the basis of the following ratios: (a) one-third on the ratio of the population of a state to the total population of the United States, its territories and insular possessions; (b) one-third on the ratio of the area of a state to the total areas above described; (c) one-third on the ratio of rural-mail delivery and star-route mail roads of a state to the total of such mileage in the areas

(*Concluded on next page*)

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Reversible transmission on both the feed roller and agitator permits changing from forward to reverse motion, or vice versa, by simply shifting a lever.

The Swivel-type Adjustable Hitch allows the Traction Wheels of the Spreader to be on the Ground at all Times regardless of what position the truck or spreader is in. Easily coupled and uncoupled.

Disengaging lever for coupling and uncoupling is extended to the outside of the spreader, eliminating danger for the operator.

Sold and distributed by leading Construction Machinery Dealers throughout the United States and foreign countries.

Furnished in 6 widths— from 8 to 13 feet

Write for detailed specifications

HIGHWAY EQUIPMENT COMPANY, INC.
Manufacturers of the World's Most Complete Line of Spreaders
CEDAR RAPIDS, IOWA, U.S.A.

"...have used nothing else for 10 years"

FROM LOUISIANA

EDWARD SWAN; General Manager
Walter P. Villere, General Contractor
New Orleans, Louisiana

One of a series of testimonial letters received from all parts of the United States

"...our company uses in the construction business one of the largest draglines in the South, a Walking Monagan, capable of handling 10 cubic yards of dirt at a time.

...machine which is now working on an emergency levee building job on the Mississippi River at Baton Rouge, is powered by a Fairbanks Diesel motor.

...as you know, a Diesel motor operates faster, and under increased pressure of heat, ordinary oils form carbons and plug up piston rings...power and compression are cut to an alarming extent.

...ten years ago Macmillan Ring-Free Motor Oil was recommended as a solution to the problem of keeping machine in prime working order...we have used nothing else since.

...having been around machinery all my life, have yet to see any other motor oil accomplish in both Diesel and gasoline motors what Macmillan Ring-Free can do."

Excerpts of letter from— Edmund Swan

Other equipment operated by Villere Company: two P. H. Shovels, 1¼ yard capacity with Waukesha motors; four 1½-Ton Ford Trucks, one 1½-Ton International, one 1-Ton Diamond T; 1940 Imperial Chrysler, 1942 Oldsmobile, 1936 Chrysler, 1941 Plymouth. On Macmillan Ring-Free, of course!

MACMILLAN RING-FREE MOTOR OIL

Operators of all types of equipment report lower-cost, more efficient performance with Macmillan Ring-Free Motor Oil. Find out how it can help lick your toughest lubrication problems...Phone or write the nearest Macmillan office.

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Secondary Highways And Their Financing

(Continued from preceding page)

described in (a).

Distribution of secondary-road funds to the states is made on the ratios given as applied to population, area, and mileage including towns and municipalities of less than 5,000 population. Distribution within states is a responsibility of the state highway departments.

Distribution of urban-area funds is made on the sole basis of the ratio of populations within municipalities of more than 5,000 in any one state to the total population of municipalities of more than 5,000 in all of the states.

7. *Does the Federal government coordinate directly with municipalities, counties, or other subordinate political jurisdiction, in extension of Federal Aid for highways?*

No. Under Federal law, the Public Roads Administration of the Federal Works Agency is empowered to act only through the various state highway departments as representatives of the municipalities, counties, and towns.

8. *Will Federal-Aid secondary-road projects be constructed under force-account (or direct labor) methods?*

Generally speaking, no. The PRA advocates contracting all Federal-Aid construction and only in an extraordinary situation would any other method be approved.

9. *Does the Public Roads Administration take any part in the dealings between a state and its subordinate agencies?*

No. Beyond the requirements of Federal law that municipal, county, or other local agencies be consulted in establishing urban-area and secondary-road systems, the PRA takes no part in the establishment of intrastate policies, the allocations of funds and other cooperative matters, except that the systems, projects, plans, and operational supervision must have PRA approval. "The manner or method of cooperation with local road officials shall be determined and exercised by each state highway department."

10. *Is the Federal-Aid secondary-road program of a continuing nature?*

Yes. It is a part of a long-range program to establish an integrated network of highways of various classes and types of use, including the major classifications broadly defined as (a) interstate or interregional, (b) intercity or intrastate, (c) rural secondary or farm-to-market, and (d) intra-urban.

11. *Must the whole secondary system be selected now?*

No. But local road officials should study their local road requirements and be in a position to recommend the early inclusion of those roads which their experience determines should form the first increment of the secondary systems.

12. *Is the mileage of the eventual secondary or farm-to-market systems limited?*

Only to the extent that state and local resources for adequate maintenance exist; not by any arbitrary mileage maximum.

13. *May a selected and approved secondary system be altered or revised?*

Yes, until the roads in question have actually been approved and constructed or reconstructed under specific project agreements, the state, by agreement with the local road agency and approval of the PRA, may add new roads or withdraw roads formerly included in the system.

14. *Is stage-construction permissible?*

Yes. Once a road is included in the secondary system, a bridge or bridges may be built the first year, grading and drainage in a second period, and surfacing or paving at a still later date. Each step in the improvement will be performed under a separate project agreement.

15. *Is any local rural road eligible to inclusion in the Federal-Aid secondary system?*

Not all local roads. Such roads must be school-bus, rural-mail or star-route delivery roads, or principal feeder or farm-to-market roads serving extensive land use and connecting on one end, and preferably both ends, either directly or through other Federal-Aid secondary roads, with the main Federal-Aid system. For instance, a secondary road may traverse 25 or 30 miles from one Federal-Aid route to another, including, say, 10 miles of state highway, 7 miles of county road, and 3 miles of township road. But it would all be eligible as a Federal-Aid secondary route for inclusion in the secondary system, by agreement of the township officials with the county road authorities and they in turn with the state highway authorities.

16. *How may I obtain more detailed information regarding the inclusion of roads in my county in the Federal-Aid secondary system?*

Consult the Chairman of your State Highway Commission or your State Highway Engineer.

"It does it every time it gets low on fuel!"

The United Kingdom has 181,000 miles of streets and highways, as compared to about 3,000,000 miles in the United States. Or, compared with the United Kingdom, the U. S. has about three times the population, thirty times the area, and twenty times the highway mileage.

—Major General Philip B. Fleming, Federal Works Administrator.

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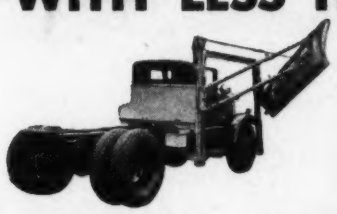
MOVE MORE SNOW WITH LESS HORSEPOWER

Reversible Blade Plows
100 Series



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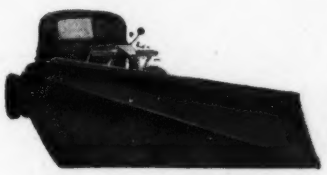
THERE IS A SIZE AND TYPE TO SUIT YOUR NEEDS EXACTLY



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700 Series

PICK YOUR PLOW FROM THE WORLD'S MOST COMPLETE AND BIGGEST SELLING LINE

One-Way Sidewalk Plow
Safety blade trip and hydraulic lift

V-Plow and Front-Mounted Wing —Full Power—Hydraulic Control
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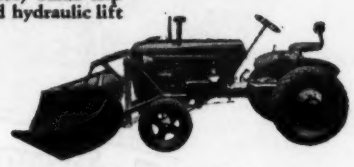

V-Type Sidewalk Plow
Climbs curbs without damage

THE OLDEST AND LARGEST BUILDER OF HIGHWAY SNOW PLOWS IN THE WORLD

RIGHT NOW BEFORE WINTER COMES SEND FOR FOLDER No. 101 IT'S FREE—NO OBLIGATION.

Medium Weight
V-Plows
500 Series

Heavy-Duty Center Plow
for removing hard packed ice and snow

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ESTABLISHED 1878

GOOD ROADS MACHINERY CORP.
Kennett Square • Pennsylvania
GOOD ROADS BUILDS CHAMPIONS

It's easier to lift, lower, push or pull the Simplex Way!

Simplex
LEVER · SCREW · HYDRAULIC
Jacks

for every construction purpose
Awarded the Gold Medal for Safety
Ask for Catalog 44
Templeton, Kenly & Co., Chicago 44, Ill.

Two U. S. Contractors To Build Bolivian Road

A $9,500,000 road-building contract has been awarded by the Republic of Bolivia, South America, to Compania McGraw-Warren Bros., S. A. This company was organized jointly by F. H. McGraw & Co., Hartford, Conn., and Warren Bros., Cambridge, Mass., with C. B. Hall, Construction Manager of the Foreign Department of F. H. McGraw & Co., and Vice President of F. H. McGraw & Co. of Panama, as President.

The new highway, 250 miles long and 16 feet wide, will be asphalt-surfaced and is designed for a maximum speed of 50 miles an hour. This is one of Bolivia's most important public works and will be the main transportation artery between Cochabamba and Santa Cruz, two rich agricultural districts which hitherto have been linked only by air.

The engineering and design of the new highway are being handled by personnel supplied by the U. S. Public Roads Administration, and the work will be partly financed by the Export-Import Bank of Washington, which is extending a loan to the Bolivian government. Construction will begin immediately and it is expected that the road will be completed in about 3½ years.

F. H. McGraw & Co. of Panama is engineer and architect for a new $7,000,000 air terminal for the Republic of Panama.

Waukesha Advances Two To Service-Sales Dept.

In carrying out an expanded service program, Waukesha Motor Co., Waukesha, Wis., has promoted Herman J. Loebl to the position of Manager of the new Distributors' Service-Sales Department, and Harvey R. Wilson to the post of Assistant Service Manager. Mr. Loebl, who has been concerned with customer relations through service for almost 30 years, has been with Waukesha since 1928. Mr. Wilson has been a member of Waukesha's service organization since 1927.

The establishment of this new department is a departure from former Waukesha policy brought about by wartime experience. Waukesha's present list of authorized parts and service distributors will be doubled within a short space of time and, in addition to the sale of repair parts, these same firms will stock and sell complete power units ranging in size from 5 to 200 hp, for operation on gas, gasoline, diesel oil, tractor distillates, or kerosene.

Cedarapids Built by IOWA

The beauty and grandeur of America's scenic wonderlands will beckon travelers soon again when America is once more "a nation on wheels". Many more miles of smooth, all-weather black-top roads will be built, providing both employment and enjoyment for millions of Americans.

Contractors who look ahead, plan ahead, will be the ones who get the bigger, more profitable road contracts. The owner of a Cedarapids Hot or Cold Mix Asphalt Plant is completely prepared to bid on any bituminous job that comes along. Flexible, easy to set up or knock down, these asphalt plants are sure and simple in operation. Grading and proportioning are accurate beyond the tolerance of the most rigid highway department specifications and outstanding performance is attained through the efficient coordination of all parts. Properly balanced, the feeder, driers, elevators, screening, batching and mixing units all work together in close harmony for fast, smooth and accurate production. Let your Iowa dealer tell you more about these profitmaking asphalt plants.

BATCH TYPES OR CONTINUOUS MIX TYPES—all sizes are available.

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THE IOWA LINE
of Material Handling Equipment Includes

ROCK AND GRAVEL CRUSHERS
BELT CONVEYORS
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REDUCTION CRUSHERS
BATCH TYPE ASPHALT PLANTS
TRAVELING (ROAD MIX) PLANTS
DRAG SCRAPER TANKS
WASHING PLANTS
TRACTOR-CRUSHER PLANTS
STEEL TRUCKS AND TRAILERS
KUBIT IMPACT BREAKERS

IOWA MANUFACTURING CO.
Cedar Rapids, Iowa

Suribachi Highway

(Continued from page 2)

ner access roads are generally built on high dam abutment excavations. This was done for two main reasons: (1) By working downhill from the top, the output of the bulldozers would be greatly increased; and (2) most of the 30,000 cubic yards of rock was near the bottom of the mountain. Its excavation would take days of precious time, because the only drilling equipment then available were jackhammers, with 6-foot steel. Perhaps if the work began at the top, it could be finished about the same time the rock job was done, and there would be no bottleneck. It was worth a try.

One of the D7's and two Allis-Chalmers HD-14's, equipped with bulldozers, bit into the base of Suribachi about noon on March 6, only five hours after the survey party started ahead. Working carefully past the sealed Japanese caves, skirting sheer cliffs where a slip might mean a 250-foot fall, the tractors inched their way up. A demolition crew, composed mostly of Seabees of this same battalion, working with scarcely enough tools (some of them were using crescent wrenches to de-fuse land mines!), cleared a path ahead of the machines. Dud shells were removed, unexploded mortar charges carted away, and land mines taken out.

In the weird light of flares and rockets the tractors kept at the job that night, and early the next morning the first tractor, an HD-14, driven by James D. Ballard, MM2/c, of Austin, Ark., lumbered out across the crater rim of Suribachi. Much of the pioneering up the mountainside had been through a loess-like volcanic ash which cut easily, and all hands were now optimistic.

Berm Cut Downhill

The bulldozers then turned around and started back towards the bottom. That was the heavy job, getting back down. The job consisted of cutting a sloping berm 35 feet wide into the side of Suribachi. It was all cut; no fill. The first rain would have washed a fill off that steep mountainside in nothing flat, and the normal rainfall on Iwo is something like 60 inches per year.

The mountainside is so steep that the surveyors, working desperately to keep ahead of the earth-movers, laid out the highway with transits, cutting in their elevations by turning vertical angles.

Bulldozers were used for only a part of the earth excavation; tractor-drawn scrapers were used as well. The scrapers carried dirt short distances and dropped it near the edge, and a bulldozer working through only this very short distance could keep the output of several scrapers pushed over the edge, thus increasing its own, and the other tractors', normal production.

Attacking the Rock

The tractor teams were making such good time after a few days that they began to believe they were unduly optimistic. It seemed as if they were. The Seabees who moved jackhammers, compressors, and dynamite to the rock cut below them, were having trouble. The rock was hard to drill, and it wore drill bits out nearly as fast as they could be put on. Jackhammers were much too light for the job, but wagon drills hadn't arrived and these little tools were all the Seabees had. "Do the job with the tools at hand" has been the rule many a military constructor has had to follow, and these Seabees were no exception.

U. S. Navy Photo

Here is Suribachi, frowning down on the Iwo Jima plains. Although the Japs used the mountain for years, they never managed to build a road to the summit.

They had only one pair of 210-cubic-foot-per-minute compressors, and four jackhammers. But they drilled and shot the rock day and night. Even the demolition men, when they were not busy risking their lives by picking up explosives, ran the jackhammers. The Seabees moved a shovel in at the bottom of the rock cut, and started it casting over the side as soon as the drillers tumbled some rock down.

The dipper teeth would not budge any of the volcanic rock in place, and every cubic yard had to be drilled and shot loose by explosives. Industrial dynamite was very scarce, but what there was of it was made available to the Seabees. A military explosive was also used.

Pull Together

The rock wall was whittled away a little at a time. All the while, the bulldozers were making steady progress down through the ash. They met where everyone expected them to meet, at the rock cut, and all forces were marshalled for a few shifts until the last traces of stone were blasted and cut away. It was exactly 14 days after the job started; two weeks to the day. The bulldozers hooked on to the Army trucks and helped them up the hill, because they were heavily loaded.

From 3,000 to 8,000 cubic yards a day had been successfully moved by less than a dozen machines. Fueling and

(Continued on next page)

VULCAN TOOLS

A complete line for every type of Rock Drill, Pavement Breaker and Clay Digger.

Vulcan Tool Manufacturing Co.

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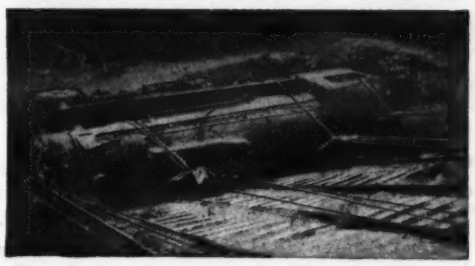
HYSTERS *are 'naturals' for tough hoisting - pulling jobs like this...*

1 This 2-8-0 U. S. A. locomotive slid down the side of a 60-foot fill that gave way after unusually heavy rains. It lay on its side at the bottom of a 45 degree slope.

2 A nearby British school of mechanical engineers loaned two "Caterpillar" tractors equipped with HYSTER Towing Winches. A skid mat of rails anchored to ties was built.



3 Two slings leading from the HYSTER Winches, and double-blocked to hand winches as a safety precaution, were then placed around the locomotive and raising got underway.

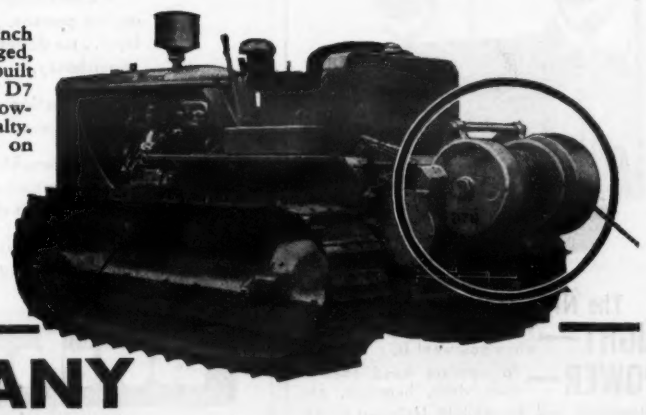
4 The locomotive was finally raised to level ground, rotated parallel to right-of-way, and rolled over on its wheels. Job was completed during bitter cold and stormy weather.

HYSTER

FOR ANY LIFT OR PULL

5 This HYSTER D7N Towing Winch was the model used on the job. Rugged, direct-geared and reversible, it's built strong to utilize the "Caterpillar" D7 tractor's immense power. Tough towing and hoisting jobs are its specialty. Write for complete specifications on HYSTER Winches.

Sold and serviced by "Caterpillar" dealers everywhere



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WORLD'S LARGEST MANUFACTURERS OF TRACTOR HOISTS AND WINCHES

Suribachi Highway

(Continued from preceding page)

maintenance had been accomplished by trucks hauling to the base of the hill, and then bringing the bulldozers down the pioneer road. Seabees took care of the maintenance problem by doing all fueling and lubrication in an hour between their shifts. They worked 7 days a week, 10 hours a day apiece. The first shift ran from 7 a.m. to 6 p.m. with an hour off for lunch. The second shift lasted from 7 p.m. until 5 a.m. The second shift was not exactly desirable, because it is not a pleasant feeling to be alone on a mountain, at night, with live Japanese soldiers.

"Design" of Road

It had been proposed to lead the Mt. Suribachi road around the mountain like a spiral staircase, but this proved to be impractical. Two turnbacks were made in reaching the top, and the highway was kept on the north slope of the volcano.

Rain eroded the finished highway badly at these turnbacks, and a repair crew had to cut ditches on the inside of the road with a motor grader, to carry the run-off water. This solved that problem, and subsequent rains have caused no damage. About three days were required for this work.

So much of the road, with all its construction decisions, had to be left up to the field officers that it may well be said that none of Suribachi Highway was plotted in an office. In bedded ash, the excavation side slopes varied from 1½:1 to ¾:1, depending on the stability of the soil. The rock was shot out on an average slope of ¼:1, which is almost vertical. The work was so urgent that not one unnecessary cubic yard was removed. Ten per cent was the minimum grade, owing to the road being kept on one side of Mt. Suribachi. Eleven per cent was common, and in one spot a grade of 13 per cent had to be cut. All vehicular traffic, however, can negotiate the highway without difficulty in a low gear.

Distinguished Visitors

After the Army trucks had gone up, 14 days after the road was started, traffic was a constant problem, and the work was finished with jeeps, weapons carriers, and trucks ascending or descending the mountainside. The most eminent visitor to the project was Fleet Admiral Chester W. Nimitz who went to the top of Mt. Suribachi with his staff, as a part of his inspection of Iwo Jima. Rear Admiral L. B. Combs of the Bureau of Yards and Docks rode one of the HD-14 bulldozers to the summit. This same bulldozer got a little too close to the edge of the mountain the next day, and was dashed to pieces hundreds of feet below. The operator, "Pat" Patterson, escaped unharmed by jumping. Parts of this tractor, which was the only piece of equipment lost, were salvaged.

U. S. Navy Photo

Fleet Admiral Chester W. Nimitz (third from left in front row) and inspection party atop Suribachi. They went up the road built by the Seabees before the island was secured.

Some Construction Statistics

The commander of the Seabee battalion which performed the Suribachi job has made the following tables of statistics available. They are quite interesting from the standpoint of operating efficiency, and give an excellent picture of the tremendous amount of work that was done by the men and machines.

The following is a typical crew, for one shift:

1 Officer in Charge in the field
2 Chief Petty Officers as shift bosses
8 Bulldozer, scraper, and motor-grader operators
5 Demolition men
5 Surveyors
12 to 15 Laborers

Some idea of the way labor was distributed can be gained by the following breakdown of man-days expended on the Suribachi job:

Supervision	42.7 man-days
Machine operators	138.0 man-days
Mechanics	29.8 man-days
Powdermen	61.0 man-days
Corpsmen	11.9 man-days
Surveyors and engineers	29.2 man-days
Truck drivers	19.8 man-days
Drillers	24.0 man-days
Laborers	471.7 man-days
Total	828.1 man-days

These figures on machine-hours worked are also interesting:

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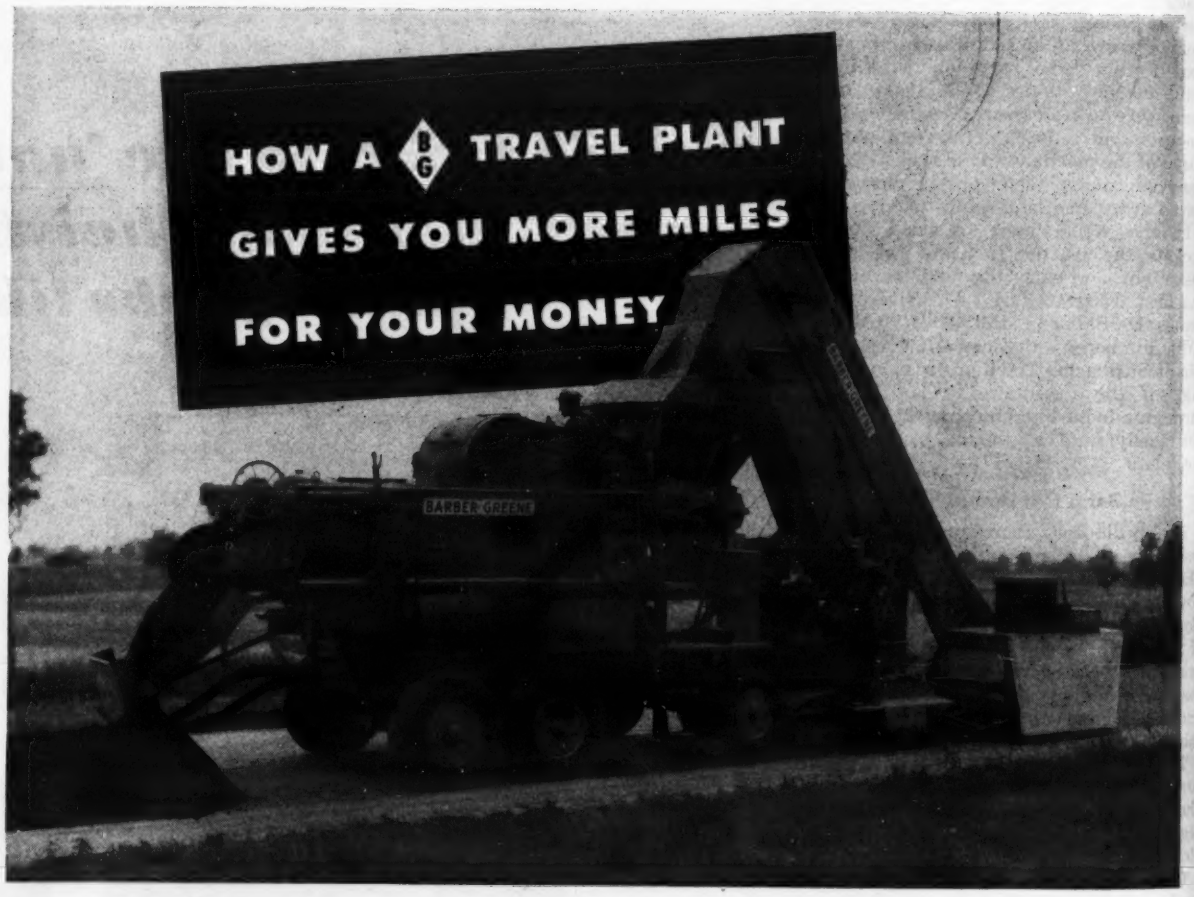

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Here's how a B-G Travel Plant cuts down construction expense to help you stretch limited funds into more miles of completed highways:

*** Continuous, high quality production. No batches, no pauses. No human element to lower capacity . . . no dependence on operating skill to maintain consistency.**

*** Reduction of the weather hazard. No partially-prepared material to be spoiled by sudden showers.**

*** Full working periods. Short mixing cycle permits operation on colder days, later at night, earlier and longer in the season.**

*** No sacrifice of bitumen quality to allow for time-consuming blading. No rich or lean spots. Lower percentages of heavier and quicker-setting bitumen with less solvent produce uniformly-coated mixes.**

*** Easy job coordination. Mixing and proportioning performed by a single unit under control of two or three men. When aggregate is windrowed well ahead, it's automatically available as needed.**

*** Low investment. Cost of the B-G Travel Plant is no more than that of the necessary machines for mixed-in-place construction of the same mileage.**

*** Versatility. Handles all types of bituminous and stabilized work. Can be centrally located for maintenance requirements . . . becomes an integral part of Central Plant set-up for production of high-type mixes.**

Write for catalogs describing how the economical operation of B-G equipment enables you to surface roads with plant-mixed material at blade-mix cost. Barber-Greene Company, Aurora, Illinois.

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Barber-Greene B G *Constant Flow Equipment*

Model NH5W with 4-80,000 C. P. floodlights.

The NITE-HAWK gives you:

LIGHT—Where you want it—when you want it.

POWER—To operate hand tools—saws, drills, hammers, etc.

Floodlight and Searchlight Units up to 14 million candlepower.

Write for Bulletin A.E.D.

LISTER-BLACKSTONE, Inc.

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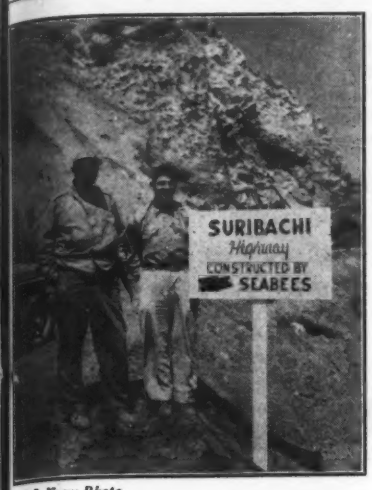

U.S. Navy Photo
Commander Paul Henderson and Lieut. Commander D. J. Ermilio, Battalion Officer in Charge, CEC, USNR. Commander Henderson is Officer in Charge of one of the Seabee Regiments at Iwo.

Suribachi Highway

(Continued from preceding page)

Make and Type of Machine		Hours Worked
Allis-Chalmers	HD-14 tractor	23
	HD-14 "	150
	HD-14 "	168.5
	HD-14 "	181
	HD-14 "	162.5
	HD-14 "	216
	HD-14 "	99
Caterpillar	D7 tractor	170.5
	D7 "	176.5
Northwest	No. 6 shovel, 1½-yard	54
Caterpillar	No. 12 motor grader	40
GMC	dump truck	200
GMC	dump truck	20
Total machine-hours worked		1,661
Total tractor-hours worked		1,347
Total yardage moved		155,000

It will be seen, from these figures, that the bulldozers averaged about 88 cubic yards an hour. This figure includes all tractors, and therefore the performance of the wheeled scrapers is also included.

Personnel

The job was done under the supervision of the Naval Construction Brigade at Iwo Jima, with Commodore Robert C. Johnson, its Officer in Charge. The battalion was headed by Lieutenant Commander D. J. Ermilio, CEC, USNR. The field officer in charge of the job at Suribachi was Lieut. (jg) Jack M. Purcell.

Many of the tractor drivers who were engaged in building the Mt. Suribachi highway came in for considerable publicity in their home-town papers. Commander Ermilio emphasized that other tractor operators, equally competent, were engaged on other work just as important, and the good work that the cat skinners did at Suribachi should not detract in any way from the credit due other operators not fortunate enough to be assigned to Suribachi.

A Nip Gets a Look-See

When the highway was built, and traffic was busily using the finished road, they let a Japanese officer who had surrendered see the project. He looked up at the side of Suribachi and saw what the Americans had done in only 21 days. Perhaps the memory of a job impossible for Japanese engineers even to contemplate raced through his mind.

Turning to his captors, he bowed politely and hissed, "Impossible! American Seabee win war!"

Trials of Contracting At Home and Abroad

In a new 217-page volume, Franklin Remington, former President of The Foundation Co., records many of his adventures as an international contractor under the title "Brawn and Brains". Following chapters on his schooling in England, his student life at Harvard, including his athletic career in football and rowing, and a thrilling trip through the Hudson Bay country in 1888, Mr. Remington launches into his early contracting experiences in Chicago. Here, as in his later chapters, he brings out pointedly the part which financing played in those early projects and subsequently for foreign governments.

After years of affluence as the grandson of the inventor and son of the manufacturer of the famous Remington rifle, Franklin Remington found himself in his early twenties nearly penniless, and invested practically his entire capital of $3,000 in a California wine venture as its Chicago agent. Then followed his entrance into contracting with one difficult construction project after another, each larger than its predecessor, and each successfully completed. From this he developed The Foundation Co., in association with the late Daniel Moran and Edwin Jarrett.

The three major episodes of the book involve the intricacies and uncertainties of engineering contracting in Turkey, Italy, and Greece where intrigue, bribery, and dictatorship were thriving. In each country there was great difficulty in "selling" the cost-plus-fee manner of payment.

Unfortunately, Mr. Remington does not record any of his experiences in Latin America, where before his retirement in 1929 his company completed 113 contracts, amounting to $42,000,000, in six different countries. The grand total of his company's engineering contracting activities was $469,900,000 for 315 contracts in the United States and fourteen foreign countries.

"Brawn and Brains" is published by Bruce Humphries, Inc., 30 Winchester St., Boston, Mass., and may be purchased for $2.75 postpaid.

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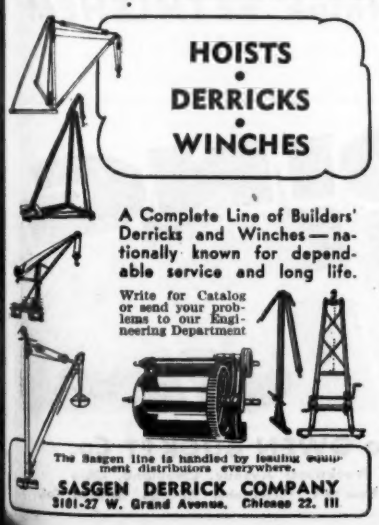

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Keep Pedestrians And Traffic Apart

Pedestrian Accidents on Rural Highways Justify Expense of Walkways to Increase Highway Safety

By C. B. McCULLOUGH, Assistant Chief Engineer, Oregon State Highway Commission

✦ THE rural pedestrian may be regarded as one of the lesser components of the traffic stream; nevertheless he must certainly be considered in the design of highway facilities. Those charged with the design, construction, maintenance, and operation of rural roads are duty-bound, therefore, to direct a painstaking and intelligent study to his convenience and safety and to the problems which are posed by his presence.

In urban areas, pedestrian trafficways are provided in the design of street facilities as a matter of course. This is an accepted and recognized procedure. On rural roads, such is not the case. The rural pedestrian, to a large extent, is regarded by vehicular traffic as an intrusion. Moreover, those benefits which, in the case of urban sidewalks, impinge upon abutting property and the community at large are not so apparent or pronounced in rural areas. Because of these facts, the pedestrian has been neglected in the design of rural roads. Obviously, in many cases, pedestrian traffic is not of sufficient magnitude to warrant the construction of walkways; however, the continuing pedestrian accident toll speaks eloquently regarding the lag between pedestrian facilities and pedestrian needs.

Oregon was one of the first states to plan for the pedestrian. Prior to 1940, approximately 100 miles of rural sidewalks had been constructed. Oregon's more recently installed pedestrian walks have been of an asphaltic mix some 2 inches in thickness supported by a light gravel base course. This type of construction is relatively inexpensive, ranging from $2,000 to $3,000 per mile, depending upon the amount of grading necessary. It is the thought of Oregon's highway officials that the construction of a more permanent and expensive facility is usually not economically warranted, particularly in those regions immediately surrounding urban areas where curb and sidewalk grades have not been established, and any current construction may have to be replaced at such time as corporate limits are extended.

Pedestrian Education

The attitude of the pedestrian in many cases is one of defiance of the rights of the motorist. The pedestrian is protected by law at intersections and at other specified points where he crosses a street or highway. Safety campaigns all too frequently stress the responsibility of the motorist without a corresponding preachment of caution on the part of the pedestrian. In many states there are no statutory enactments specifically requiring the rural pedestrian to step off the traveled way to permit a vehicle to pass.

Even though the pedestrian is required by law to face vehicular traffic, there are many cases wherein he is sorely tempted, if not compelled, to take the other side of the road. In built-up rural shopping centers a strict adherence to the law would many times necessitate crossing back and forth over the highway, creating a hazard which is perhaps even greater than walking with the traffic. Because of a narrow shoulder, or certain cuts or fills protected by guard fence, the pedestrian may be forced to use one side of the road only. All of these factors operate to augment the hazard. In Oregon the records show nearly twice as many pedestrians killed while walking with traffic as in the case of those facing traffic.

Another factor contributing to pedestrian accidents is that of visibility. If the pedestrian is not violating the law, he can nearly always see an approaching vehicle sooner than the driver can see him and can, therefore, step aside until the car has passed. Moreover, in certain cases, the driver's attention may be occupied with approaching vehicles so that he will be unaware of the pedestrian until he hits him. This is especially true during the hours of darkness. Headlights are visible for long distances, especially when on the high beam. Even if the pedestrian has his back to the car (that is to say, if he is walking on the wrong side of the road), he will generally be aware of an approaching vehicle at night long be-

(Continued on next page)

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Pedestrian Walks

(*Continued from preceding page*)

fore the driver can see him. A large number of drivers involved in pedestrian accidents state that they did not see the pedestrian until just before the moment of impact.

All of these facts and conditions point to the need for a continued and intensive campaign of education, a campaign wherein all of the pedestrian's hazards and the factors which operate to modify them are forcefully brought to his attention. Without such a campaign of education, the best of engineering will fall short of its ultimate objective.

Allocating the Cost

One of the troublesome problems involved in the programming of rural pedestrian facilities is that of cost allocation. Who should pay for them and in what proportion? In Technical Bulletin No. 10, "An Analysis of the Highway-Tax Structure in Oregon", the author of this article stated:

"Funds for the construction, maintenance, and operation of highway systems are derived, in the main, by means of assessments, taxes, and other imposts, levied in various ways and against different groups. These levies are presumably in consideration for certain and sundry benefits which accrue by virtue of road and street improvement. Such benefits are various and many, and impinge in different degree and manner on each of the several groups of beneficiaries. There are, however, certain basic principles, a rigid adherence to which is indispensable to the formulation of an equitable and adequate program for highway taxation. Concisely stated, these are:

"1. That taxes and imposts be levied against each of the various beneficiary groups in direct proportion to the benefits derived.

"2. That the tax monies received from each beneficiary group be distributed for expenditure in such manner as to produce maximum-benefit returns to that group.

"3. That taxes and imposts be sufficient, but only sufficient, to meet such costs as are both necessary and warranted in view of the benefits."

It would appear that a similar set of criteria could logically be applied to the allocation of costs for constructing pedestrian ways. The principal beneficiaries of rural sidewalks are: (1) the road user; (2) the community at large; and (3) abutting property.

The road user benefits from a separation of rural or suburban vehicular and pedestrian traffic in several ways. He saves in time, because a time loss is always involved when he has to slow down to avoid pedestrian traffic on the traveled way. Even though the pedestrian is walking on the shoulder, a potential hazard exists since he may suddenly step out onto the roadway. A careful motorist will therefore slow down. In many instances accidents involving other vehicles have occurred due to the sudden swerve of a driver to avoid hitting a pedestrian; here is a monetary loss. If the motorist involved in a pedestrian accident is hailed into court, sympathy is against him; even though he be, in fact, guiltless, litigation of this character generally involves a pecuniary loss. Certainly the motorist should pay his share for the elimination of these frictions, impediments, and potential hazards.

The community adjacent to the sector protected by pedestrian walkways is a distinct beneficiary. Rural community and shopping centers follow the construction of highway radials from urban centers in the familiar "starfish" or "explosion" plan, with ribbon development extending out for many miles beyond the urban limits. Such a tendency, though universally deplored by engineers and city planners, remains unchecked in large degree and will continue to remain unchecked until the enactment of adequate "freeway" legislation and rural zoning ordinances.

Such an explosion pattern results in depreciated property values in the downtown district and a lowering of the tax base. Moreover, this general exodus from the main business districts out onto the highways results in traffic congestion and an augmented pedestrian toll. Certainly in those ribbon-development areas the community should be required to stand a substantial portion of sidewalk costs. The justice of this assessment is based upon the direct monetary benefits flowing to these suburban developments as well as upon the general equity of requiring them to contribute financially towards minimizing the hazards which they solely have created.

Abutting property specifically, in addition to the entire suburban community in general, should be required to contribute to the cost of sidewalks for the same reasons mentioned in the case of the community at large and for the additional reason that the value of the property is greatly enhanced. Sanitary conditions are improved because of the elimination of dust and mud tracked into their establishments; the appearance of the property is definitely better since the pedestrian way forms a neat

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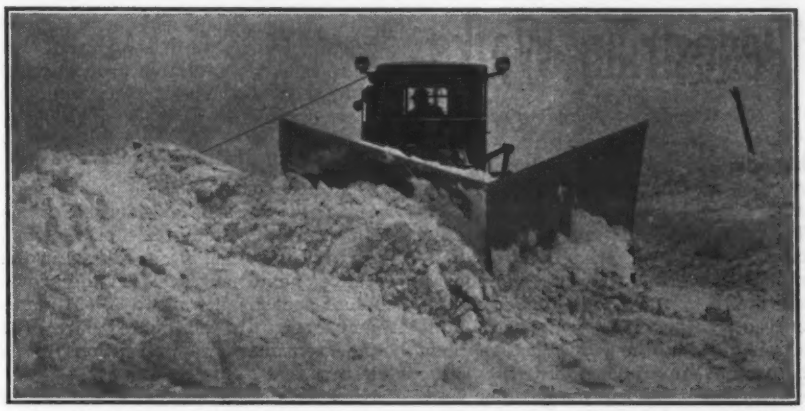
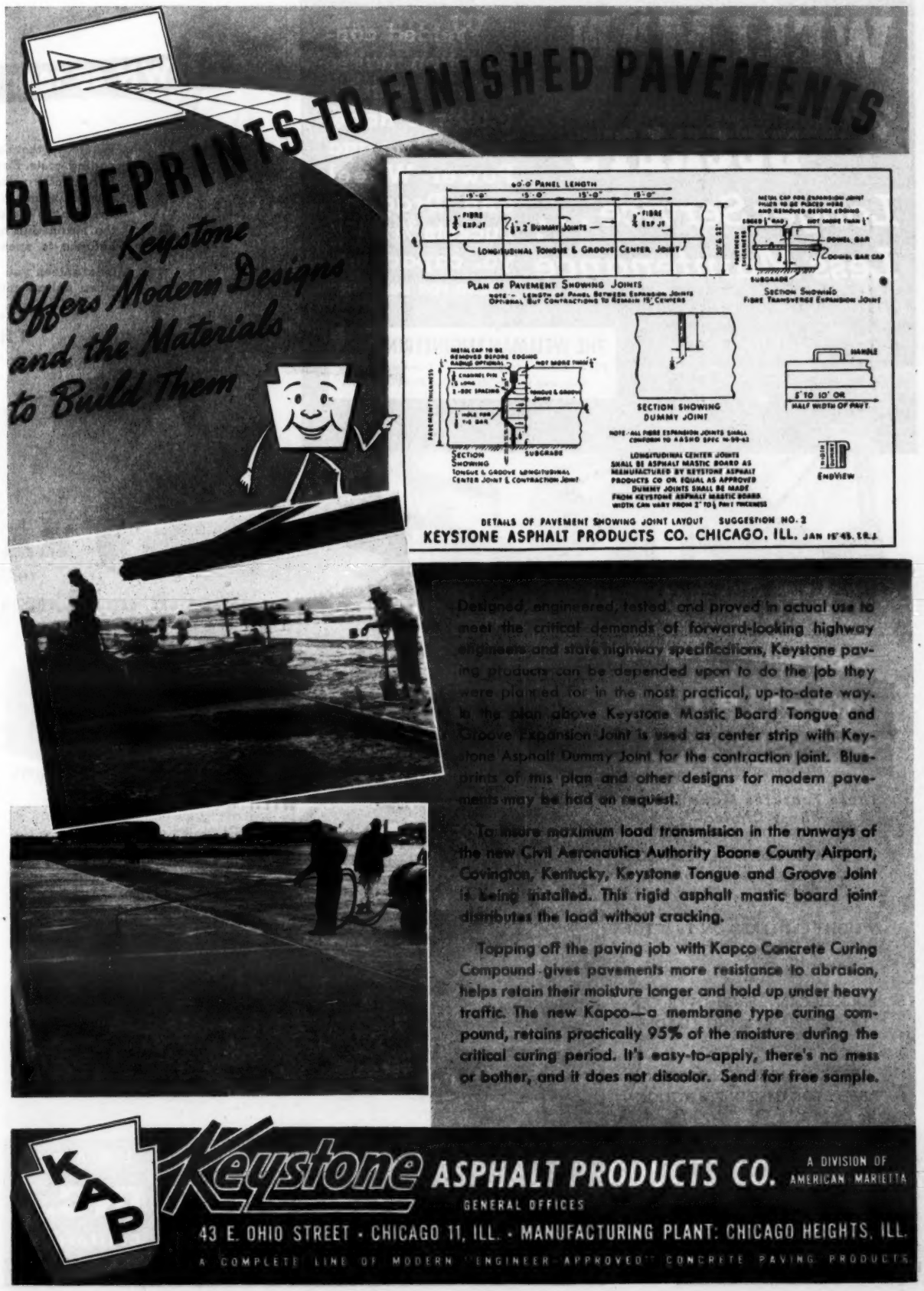


It's not too late to inspect and overhaul your snow-plowing equipment in preparation for another possible heavy snowfall this winter. Many states and counties, like Hamilton County, Iowa, mount snow plows and wings on their Caterpillar motor graders, thus getting year-round service from this type of maintenance equipment.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Pedestrian Walks

(*Continued from preceding page*)

boundary structure eliminating the ragged, unkempt appearance so often in evidence in front of suburban places. The walkway, being a convenience for customers, attracts trade, and the definite lines of the walkway boundaries serve also for the control and convenience of the parking of vehicles. Landscaping around the pedestrian way may be used as an adjunct to intrinsic value enhancement; and in many other ways the property owner abutting the sidewalk may derive benefits.

It would appear, therefore, that in suburban areas these three beneficiaries (the road user, the suburban community, and the abutter) should all share in the cost of pedestrian ways. The exact pro rata share of each of the contributors must obviously be varied with individual conditions and needs. Beyond the suburban fringe, it is apparent that the road user's equitable proportion of the total cost burden increases while the others diminish.

Design of Rural Walkways

The pedestrian accident toll appears sufficient to warrant considerable attention from the standpoint of highway design. The principal expedients in the field of engineering are: (1) the provision of pedestrian walkways, (2) pavement design to eliminate glare, (3) other remedies and precautions to be discussed.

Pedestrian walkways may be of gravel; crushed stone; oiled gravel or stone; bituminous macadam; asphaltic concrete (plant-mix); or portland-cement concrete. The structural design of these facilities is elementary. Widths must obviously vary with conditions and needs. For light pedestrian traffic, a 4-foot walk may prove adequate; this width, however, is about the minimum except on rural bridges where a 3-foot 6-inch walk has been successfully employed. Obviously maintenance should be such as to preserve the design width and encourage the continued use of the walk; otherwise, pedestrian traffic may revert to the shoulder.

Designing and constructing pavement surfaces in such a way as to eliminate glare are necessary. Other remedies and precautions against pedestrian accidents find an economic warrant in certain instances. Some segments of highway may need special lighting treatment; sodium-vapor units, specially designed mercury Mazda lamps, and other luminaire types have been utilized in this connection. In congested areas, pedestrian overpass or underpass structures may find justification. In the case of multi-lane highways, diagonal intersections, and any other arrangement wherein the pedestrian is required to traverse comparatively long distances in crossing, the installation of intermediate islands or refuge bays may be warranted. Where a rural business establishment occupies a comparatively large frontage, it is many times necessary to restrict egress and ingress to a few isolated points, that is individual driveways, in order to localize traffic movements and thus protect the pedestrian.

All of these latter remedies, however, are more or less special, and each factor involved must be studied individually. Even the most rudimentary discussion of the design of pedestrian refuge bays, traffic islands, and egress and ingress facilities would require much more space than is available here.

Conclusion

The extent of pedestrian fatalities is sufficient to warrant great effort along the line of accident prevention. In addition to the expedient of more drastic and meticulous enforcement of present traffic laws, there appear to be two major directions which this effort should

(*Concluded on next page*)

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Pedestrian Walks

(Continued from preceding page)

take: (1) a continuing and intensive campaign of safety education both for the motorist and the pedestrian; and (2) a greater degree of attention to pedestrian needs in the planning and engineering of rural highways.

In general, the engineering details involve (1) the provision of pedestrian walkways at all points where conditions furnish an economic warrant; and (2) the design of pavement surfaces in such a manner as to eliminate glare to the maximum possible degree. In addition, certain locations may demand special lighting treatment or pedestrian overpass or underpass crossing structures.

Entrance and exit facilities to rural roadside establishments should be localized in order to protect the pedestrian, and wide thoroughfares, diagonal intersections, and other points where pedestrians are required to traverse comparatively long distances should be equipped with suitable islands or places of refuge.

The cost of providing pedestrian ways is not only the obligation of the road user, but also, in part, the equitable obligation of the community at large and of abutting land. The road user's equitable contribution increases, however, as the locale departs from the suburban fringe to the truly rural districts.

From a paper presented at the Second Highway Traffic Conference of the Eno Foundation for Highway Traffic Control in New York City, May 25, 1945.

Novel Pontoon Bridge Across Fast Stream

A hank of rope, a couple of sampans, and some G.I. gasoline drums, combined with American resourcefulness, earned the Bronze Star Medal for meritorious service for Lt. Bernard Caress of New York City. Faced by the 15-feet-per-second rushing waters of the Yuan Ho in China, Services of Supply convoys were halted in their drive to replenish the needs of Chinese troops in that sector. The ancient ferry proved incapable of moving the tremendous amount of supplies piling up at the river's edge. Caress was ordered to the section with instructions to solve the problem with the help of a Chinese engineer battalion located nearby.

The problem was solved, according to Lt. Caress, because Major H. C. Wang, the commanding officer of the Chinese engineers, operated with him as a team. Nothing seemed too difficult for the Chinese to undertake and they didn't waste a minute. Within six days a pontoon bridge was built across the Yuan that took all the traffic necessary.

Building a bridge only a few miles from the front is not an easy task under any circumstances. In this instance a bridge was required where pontoons, Bailey bridges, screws, nails, even lumber were not available. With Major Wang, Lt. Caress inspected the river and the possible bridgeheads. Finding that only a bridge could meet the immediate need, the Chinese and American officers scurried around to find enough material to make pontoons.

Dozens of river sampans were acquired. In an abandoned warehouse in the upper reaches of this river, they located a few old German pontoons hidden away for almost six years. From Services of Supply in Chihkiang, GI trucks hauled hundreds of empty gasoline drums to fill in where needed. Nails could not be found, so rope became the binders and Chinese G.I.'s swam the 900-foot river eight times before three bridle ropes could be drawn tight and held firm.

Lt. Caress, who was a construction engineer with the Federal Construction Corp. in New York City before he entered the Army, devised the method of lashing drums to sampans and both to the few German pontoons. Using ¼-inch rope, section after section was tied together at the banks and floated to its appointed place in the stream. Just as the operation was about to be completed, a terrific monsoon ripped a half dozen sampans loose and almost wrecked the entire job.

By raising the sides of the boats, by urging and cajoling the tired Chinese soldiers, Wang and Caress had the wrecked sampans replaced within a few hours and the job was completed.

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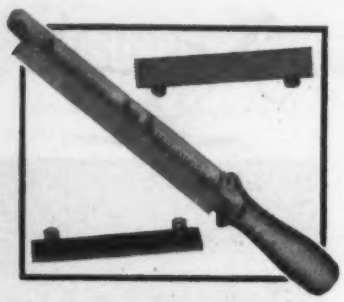

The New Kennametal lathe file has a number of improvements over previous models.

A New Lathe File

A new lathe file that retains the advantages of previous Kennametal models said to cut steels that ordinary files will not touch, at speeds 3 to 10 times faster than possible with steel files and with a life 50 to 200 times as long, has recently been announced. These files are also claimed to provide a longer filing surface, quick easy blade replacement, and greater handling convenience.

The Kennametal blanks in this new design made by Kennametal Inc., Latrobe, Pa., have brazed-on nuts and are attached to the light-weight aluminum-alloy handle by screws. They can therefore be replaced readily when worn from long service. Two types of blanks, fine with 30 teeth per inch and coarse with 20 teeth per inch, are available, and are interchangeable on the same handle. The grip is shaped to fit the hand, and has a thumb rest and knuckle guard. An extension beyond the filing surface supplies a convenient finger hold. A hole in this extension permits the file to be hung up.

One size of these new files is now available, the F-45, which measures 13½ inches long overall, with a filing surface ¾ inch wide x 8 inches long, comprising two ¾ x 4-inch Kennametal blanks. Complete information regarding these lathe files may be secured direct from the manufacturer by mentioning this illustrated news item.

Caterpillar Announces Representative Change

Garrett R. Roelfs has been appointed Caterpillar District Representative for western New York State, Vermont, and New Hampshire, according to a recent announcement by the Caterpillar Tractor Co., Peoria, Ill. Mr. Roelfs succeeds T. C. Kinney, now associated with Vincent S. Jerry, Caterpillar distributor in Plattsburg, N. Y.

Following a sales career in the utility field, Roelfs joined the Caterpillar organization in January, 1944, served as Domestic Credit Manager, and more recently has been engaged in developing post-war selling plans. He will make his headquarters in Albany, N. Y.

"Theb" Kinney started in the Parts Department in Caterpillar in 1934, and became a District Representative in January, 1944. In his new connection he will continue to devote his efforts to the sale of Caterpillar products.

Major Thomas R. Clark, who resigned his position with Caterpillar in July, 1942, to enter the U. S. Corps of Engineers as a tractor specialist, has just received his honorable discharge from the Army and rejoined the Caterpillar organization. He will serve as District Representative with headquarters at Omaha, Nebr.

Clamshell Buckets

A new folder on Pettibone Mulliken all-purpose clamshell buckets, one of the Big 4 line of buckets made by the Pettibone Mulliken Corp., 4710 W. Division St., Chicago 51, Ill., has recently been issued. In addition to illustrations of these buckets, specifications on sizes, capacities, and weights, and descriptions of the salient features, the folder also contains views of the company's plant.

Those interested may secure copies of this folder without obligation by addressing their requests direct to the company and mentioning this item.

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Reservoir Spanned By Modern Structure

Concrete Trestle, Steel Girder, and Long Approach Fills Required; Bailey Bridge Used Temporarily

♦ U. S. 51 now crosses Arkabutla Reservoir in northwestern Mississippi on 1,050 feet of concrete-trestle bridge which is flanked at each end by over a mile of earth embankment 15 to 18 feet high. At the Coldwater River channel crossing, the concrete-trestle construction gives way to a steel-girder 100-foot span. Before the building of the dam, 12 miles to the west, and the impounding of the reservoir, Coldwater River was crossed by a narrow truss bridge, 100 feet long, which connected with 2,200 feet of timber trestle spanning the low-lying swamp land on both sides of the river.

When the Federal government completed the dam which forms the reservoir, the existing roadway crossing had to be raised about 16 feet in order to keep it from being flooded. Inasmuch as it was impracticable to raise the existing roadway to the required elevation, the new construction was planned on a revised alignment downstream from the old roadway. At first, U. S. Engineers decided to carry the north-south highway across on a 20-foot creosoted-timber structure the same width as the original bridge, and use the old truss at the channel. Mississippi State Highway Department engineers, however, desired a 24-foot roadway on a concrete bridge, so an agreement was made between the State and Federal government that the extra cost involved in building an improved structure would be borne by the State.

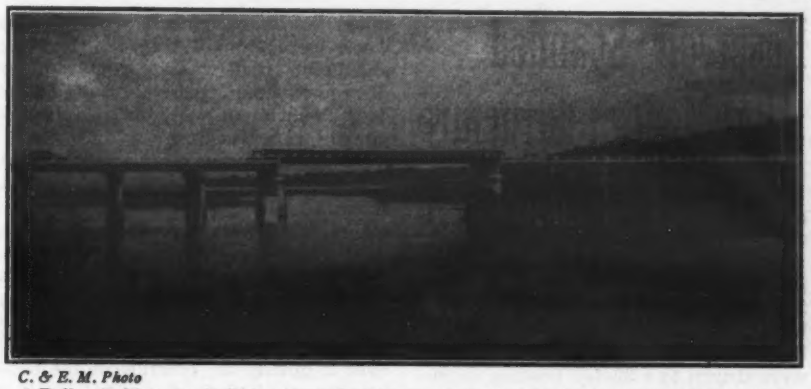
Estimates were made, and the bids asked included both the narrow timber type of construction and the wider concrete-trestle bridge with a steel-girder span over the main channel. Because of the scarcity of timber, the extra cost to the State for 24-foot concrete trestles instead of 20-foot timber trestles was only around $5,000, but the State also paid for furnishing and erecting the steel-girder channel span.

Delay in obtaining the necessary steel girders to complete the bridge created a crisis in the early part of January of this year when a flood washed away two of the timber approach spans to the old bridge, stopping traffic on this main highway from Mississippi north to Memphis, Tenn. The Highway Department immediately replaced these spans. However, subsequent rains the first part of March raised the water in the pool, flooding the old highway, and requiring traffic to use a long detour. To ease the situation, the Army threw a Bailey Bridge, a military innovation of this war, across the 100-foot span, connecting the completed portions of the concrete trestle, thereby permitting traffic to use the new route. The Bailey Bridge served until the water in the pool was lowered sufficiently to permit traffic to return to the old highway, and in the meantime the long-awaited steel arrived to close the last gap in the new bridge.

U. S. Engineer Contract

The construction of the earth embankment and the concrete-trestle bridge was under the direction of the U. S. Engineer Department through the Vicksburg, Miss., District Office. A contract for 11,708 linear feet of embankment, 4,973 feet north of the bridge and 6,735 feet to the south, was awarded to the W. G. Cook Construction Co. of Jackson, Miss., which began work in October, 1943. Material for the 15 to 18-foot fill, which has a crown width of 31 feet and 1 on 3 slopes, came from borrow pits on both sides of the river. Grading was completed in the late autumn of 1944, after which the contractor put down a 3-inch layer of mixed-in-place sand-asphalt, but adverse weather conditions in the form of rain and low temperatures during the construction period resulted in a rough surface, so last spring the material was plowed up by a grader, given more asphalt, then reworked and relaid. To this course the Mississippi Highway Department later will add 2 inches of bituminous seal coat for a wearing surface, making a total pavement thickness of 5 inches. Over the fill the pavement is 20 feet wide with 5½-foot shoulders.

Construction of the concrete bridge was let to the E. O. Korsmo Construction Co. of Memphis, Tenn., which began work in January, 1944, and finished all concreting by the end of the year. The contract included 1,050 feet of trestle with two concrete-pile end bents and two concrete piers on each side of the main channel. South of the river piers are twenty-three 30-foot concrete-girder spans, while to the north are twelve 30-foot spans.



C. & E. M. Photo

A Bailey Bridge was built by Army Engineers across the gap in the uncompleted bridge over Arkabutla Reservoir in Mississippi to relieve a traffic emergency caused by floods on the old route.

Concrete Construction

The trestle work consists of concrete-

(*Continued on next page*)

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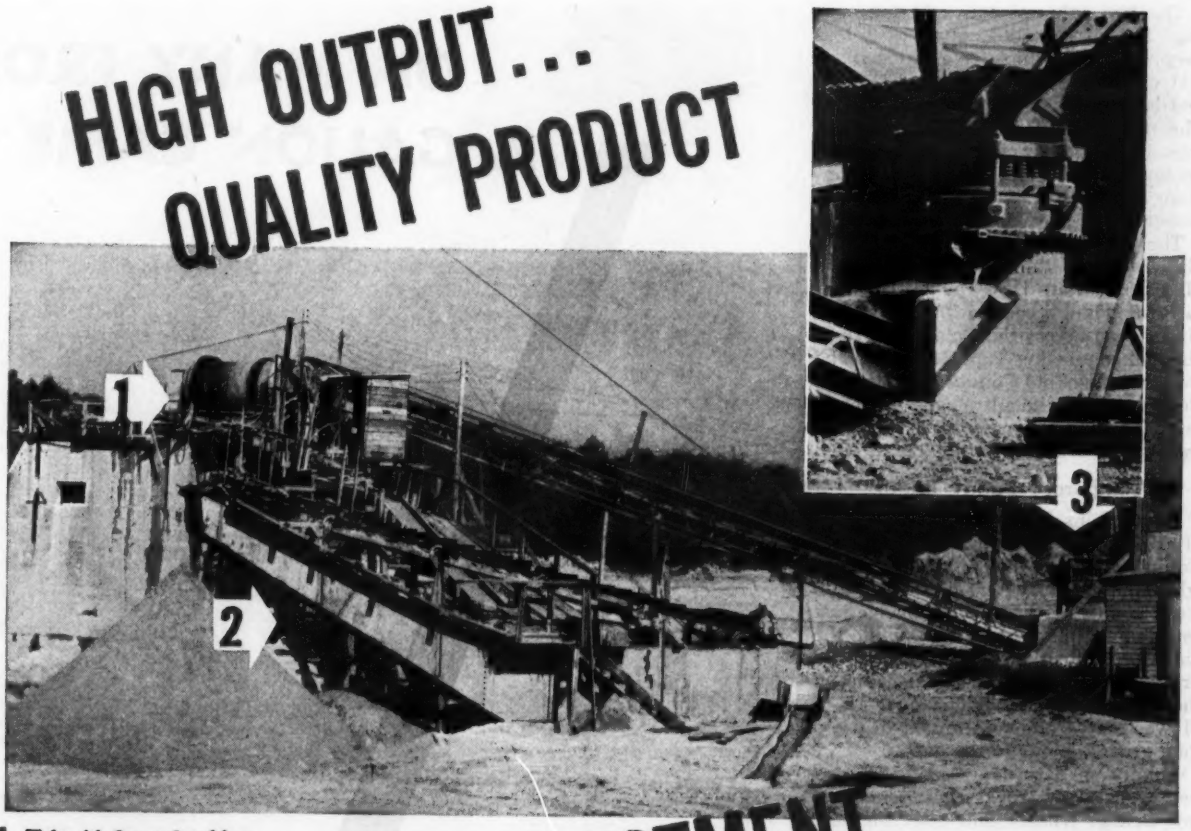

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Reservoir Spanned By Modern Structure

(*Continued from preceding page*)

pile bents composed of four precast concrete piles spaced 7 feet on centers with the two outer piles battered. The piles are 16 inches square, from 40 to 50 feet long, reinforced with spiral hooping, and tapered at the end to an 8-inch square section. After the piles were driven to a 32-ton bearing capacity, they were surmounted by a reinforced-concrete cap, 2 feet 6 inches wide, 2 feet 3 inches deep, and 24 feet 8 inches long, with the piles projecting 12 inches into the caps. The superstructure consists of 30-foot concrete-girder spans, each span having four girders, 1 foot 5 inches wide x 1 foot 10 inches deep, 7 feet on centers, which support a 7-inch reinforced-concrete slab, giving the bridge 24 feet of clear roadway and a 1½-foot walk on each side.

The two-column piers rest on footings 10 feet 6 inches square x 7 feet deep, each of which is supported on sixteen untreated timber piles, 20 to 30 feet long, and driven to 18-ton bearing. The piles extend 5 feet into the footings, which are spaced 26 feet center to center laterally, and 100 feet 8 inches along the longitudinal axis of the new bridge.

The E. O. Korsmo Construction Co. also received the contract from the Mississippi State Highway Department to furnish and erect the 100-foot plate-girder span across the Coldwater River channel connecting Tate County on the south with DeSoto County on the north. Considerable difficulty was encountered in obtaining the steel, delaying the start of erection until early in May.

Temporary Bailey Bridge

Heavy rains during the closing weeks of 1944 converted the usual placid Coldwater River into a raging torrent which swept away two of the wooden trestle bents on the existing bridge just south of the main truss span, while the waters rose to a height covering the old bridge which lies about 250 feet east of the new structure. Traffic over U. S. 51 was halted and was forced to use a long gravel detour to the east.

Finally on Saturday, April 7, a convoy of 42 Army trucks containing Bailey Bridge trusses and 134 Engineer troops from Co. B, 1298th Engineers Combat Battalion, at Camp Shelby, Miss., arrived at the bridge site. In command was Captain Joe Hoffman of Washington who had spanned the Rapido River at Cassino, Italy, with the same type of Bailey Bridge. Inside of 6 hours, the Army Engineers had connected the two main piers with a 110-foot Bailey span having a 12-foot roadway and a load capacity of 15 tons. Maximum speed limit over the bridge was 10 mph and it was tested immediately by having several Army trucks run over it.

The bridge is made up of individual trusses or side panels, 10 feet long x 5 feet high, weighing 504 pounds, and connected by pins. The trusses were joined together on the bridge approaches and pushed out over the water on rollers at the rate of one truss for every two that were built up. New sections were added behind and the bridge pushed farther out in cantilever fashion until it rested on the opposite approach. The rollers were then removed and the bridge securely anchored to the piers while the excess trusses from the working side were disconnected. A wooden-plank roadway was supported by 16-foot steel cross beams at the end of each truss. Personnel walks, 2½ feet wide on each side, were added.

The normal wartime speed for erecting this length and type of bridge is 3 hours but the Engineers who did this work were from a training company and great speed was not required. So pleased was the Mississippi State Highway Department with the results obtained from the use of the Bailey Bridge that it hopes to purchase several of this type of bridge, in 50 to 60-foot spans, to have on hand for emergency maintenance work after the war.

Steel-Girder Span

Highway Department maintenance forces repaired the old flood-damaged bridge so that traffic could be resumed over it during the erection of the permanent steel-plate girders to replace the Bailey span. Steel for the new span was purchased from the Virginia Bridge Co. of Roanoke, Va., and was trucked from the fabricating shop in Memphis, Tenn., to the job site.

The essential features of this span are the two main girders, 100 feet long and 26 feet between center lines, each weighing about 26 tons. These girders are 48½ inches deep, back to back of angles, and each is composed of a 48 x 9/16-inch web plate, four 8 x 8 x ⅞-inch flange angles, and six cover plates, three on top and three on the bottom. Two of these cover plates are 18 x ⅝ inch x 47 feet long; two are 18 x ¾ inch x 67 feet 2 inches long; the

(*Concluded on next page*)

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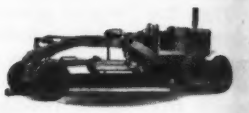

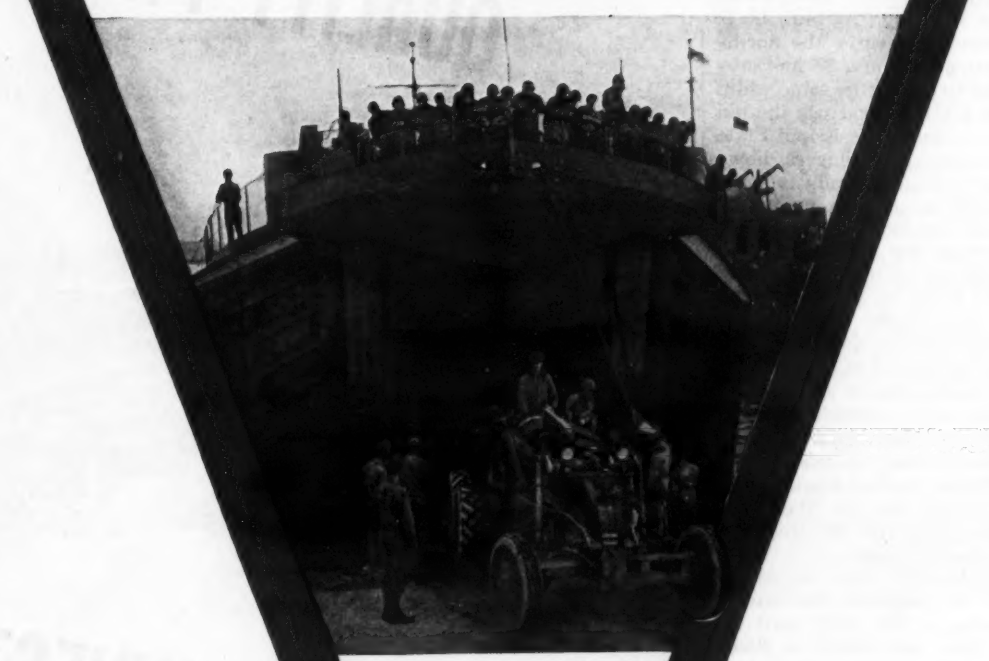

Acme Photo

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(Continued from preceding page)

remaining two are 18 x ¾ inch x 80 feet 6 inches long. At the center of the span there is a 2½-inch camber in the girders to compensate for dead-load deflection.

Connecting the girders and spaced at 16-foot 8-inch intervals are 27-inch 100-pound wide-flange (WF) floor beams supporting three stringers, which are 18-inch 47-pound WF I-beams spaced 6 feet 6 inches on centers. On top of the stringers is a 7-inch reinforced-concrete slab providing a roadway width of 24 feet, at each side of which is a 1½-foot walk. The bridge is designed for H-15 loading and has ⅞-inch rivets throughout. This last phase of construction was completed by mid-July when the entire bridge was opened to traffic.

Quantities and Personnel

The major estimated quantities on the approach fills which were built by the W. G. Cook Construction Co. of Jackson, Miss., for the contract price of $253,000 were as follows:

Excavation	541,000 cu. yds.
Compacted fill	454,000 cu. yds.
Sand-clay topping material	20,000 cu. yds.
Clay-gravel base course	5,530 cu. yds.
Aggregate for surface course	2,700 cu. yds.
Cut-back asphalt	59,400 gals.

The E. O. Korsmo Construction Co. of Memphis, Tenn., did all the bridge work, constructing the 24-foot concrete trestles and the two river piers for $154,000 and erecting the steel girders for $18,724. The major items on these jobs were:

1,050-Foot Concrete Trestle

Precast-concrete piles	6,210 lin. ft.
Concrete in bent caps	184 cu. yds.
Concrete in deck girders	1,153 cu. yds.
Steel reinforcement	295,300 lbs.

Two River Piers

Untreated-wood piling	1,600 lin. ft.
Excavation	410 cu. yds.
Concrete	217 cu. yds.
Steel reinforcement	15,000 lbs.

Steel-Girder Span

Structural steel	75 tons
Concrete for floor	70 cu. yds.
Steel reinforcement	9,000 lbs.

The total cost of the project was $425,724. Joe Westin was Superintendent for the E. O. Korsmo Construction Co. and A. J. Yates was Superintendent for the W. G. Cook Construction Co. Lt. Col. R. W. Sauer is District Engineer, Vicksburg District, U. S. Engineer Department, for which Jim Stevens was Chief Inspector. H. L. Smallwood was Resident Engineer for the Mississippi State Highway Department, of which J. D. Monette is Acting Chief Engineer, with headquarters at Jackson, Miss.

States Resurfaced 8,985 Miles of Roads

The program of resurfacing of state highways to "keep 'em rolling" during the war continued without letup. The most recent complete report released by the Public Roads Administration is for the calendar year 1943. Of the total of 8,985 miles of primary highways resurfaced outside of cities, 5,050 miles were resurfaced with some other type of material than the original surfacing, and 3,935 miles with the same material.

No construction of this type was reported to the Public Roads Administration by Delaware, Rhode Island, and Vermont, so the figures represent only forty-five of the total number of states. Alabama resurfaced 485 miles; Arizona, 49 miles; Arkansas, 199 miles; California, 100 miles; Colorado, 6 miles; Connecticut, 83 miles; and Florida, 117 miles. Georgia completed 425 miles; Idaho, 132 miles; Illinois, 302 miles; Indiana, 797 miles; Iowa, 43 miles; Kansas, 117 miles; Kentucky, 765 miles; Louisiana, 19 miles; Maine, 1 mile; Maryland, 42 miles; Massachusetts, 5 miles; Michigan, 113 miles; Minnesota, 179 miles; Mississippi, 20 miles; Missouri, 51 miles; Montana, 26 miles; Nebraska, 174 miles; Nevada, 38 miles; New Hampshire, 1 mile; New Jersey, 6 miles; New Mexico, 85 miles; New York, 235 miles; North Carolina, 10 miles; and North Dakota, 10 miles.

Ohio led off with a total resurfacing mileage of 1,856, while the programs in the following states, in alphabetical order, were: Oklahoma, 233 miles; Oregon, 24 miles; Pennsylvania, 164 miles; South Carolina, 37 miles; South Dakota, 88 miles; Tennessee, 282 miles; Texas, 1,139 miles; Utah, 164 miles; Virginia, 68 miles; Washington, 29 miles; West Virginia, 51 miles; Wisconsin, 180 miles; and Wyoming, 35 miles.

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Dry Snow and High Winds Create Winter Problems

Repeated Plowing Needed To Keep Highways Open; Snow Fences Set on Drifts; Shelter Houses Provided

By FRANK B. SARLES,
Western Field Editor

✦ SEVERE snow storms accompanied by strong winds and the long distances between towns make the snow-removal problems of the Wyoming Highway Department severe enough, but the difficulties are multiplied when high winds blow snow from surrounding country back onto the roads requiring repeated removal. This blown snow also complicates ice control so that during the winter months the lives of those responsible for keeping the highway system open are neither quiet nor restful.

About 90 per cent of the 4,113-mile system is kept open, only a few of the higher passes in this state, where 4,000 feet is considered lowland, being closed.

Normal Snow-Plowing Procedure

Snow-plowing operations are generally handled by the same organization used for routine maintenance, consisting of five District Maintenance Engineers, each having four or more crew foremen under his direction. Motor-grader operators, ordinarily employed in sufficient numbers so that each is responsible for patrol maintenance on approximately 25 miles of road, work on a regular salary, and this organization is augmented by men hired on an hourly basis.

At the start of a snow storm, one-way plows, mounted on 1½ and 2-ton trucks, immediately go into action, plowing in the direction of traffic at a speed of 25 to 30 miles per hour. Drivers are rotated and the equipment kept in continuous operation through the duration of the storm and for as long afterwards as is necessary to open the highway system. Because of long distances between towns, with a resultant hindrance to communications, the plows are usually operated in fleets of from two to four in order to be available for mutual aid in emergencies, as well as to perform the complete clearing of the highway as expeditiously as possible. Because of the tendency for the snow to blow back on the road, it is plowed off to the lee side. The first plow takes the outside cut, the second following him nearer the center of the road, and the third throwing snow from the center entirely off the traveled way. This practice is followed on roads 30 feet wide where it is impossible to move snow from one side of the road clear across to the other side with small plows, due to the fact that too much snow would be accumulated. Plowing at this high rate of speed and early enough to prevent, in most cases, the formation of heavy drifts, these units are able to throw the light dry snow characteristic in Wyoming well clear of the road shoulders.

Since the winds accompanying snow storms in Wyoming are usually from the west, there is little tendency for east and west roads to become blocked. Through years of experience, the responsible authorities have learned which roads are most likely to give trouble and which sections of these roads require the most attention. A high percentage of the snow storms can be handled by the procedure described, particularly in the Big Horn Basin of the north central section of the state where snowfall is comparatively light. However, in the Jackson Hole country in the northwestern part of the state, where 7 feet of snow is not uncommon, and in all sections of the state during a particularly severe storm, heavier V-plows, mounted on 4 and 5-ton FWD trucks, aid the lighter plows in snow removal. These trucks plow, also in the direction of traffic, at 10 to 15 miles per hour. Some of them are equipped with wings and are utilized for clean-up when, due to excessive or repeated snow storms, the lighter faster plows are unable to throw the snow completely off the road.

For still heavier storms, 10 rotary plows, including 3 large Snogos mounted on 4 and 5-ton FWD trucks, 2 Bros plows on 2-ton all-wheel-drive International trucks, 3 Snogos on Ford-Marmon-Herrington trucks, and 2 Roto-Blades mounted on 4-ton FWD are available. These rotaries are stored in the district shops and are subject to movement about the state as directed by the central office. Their use is largely confined, however, to the southern half of the state as the wind has a tendency to form heavier and more resistant drifts in that area.

Only in exceptional cases do snow storms last longer than three days, but

(Continued on next page)

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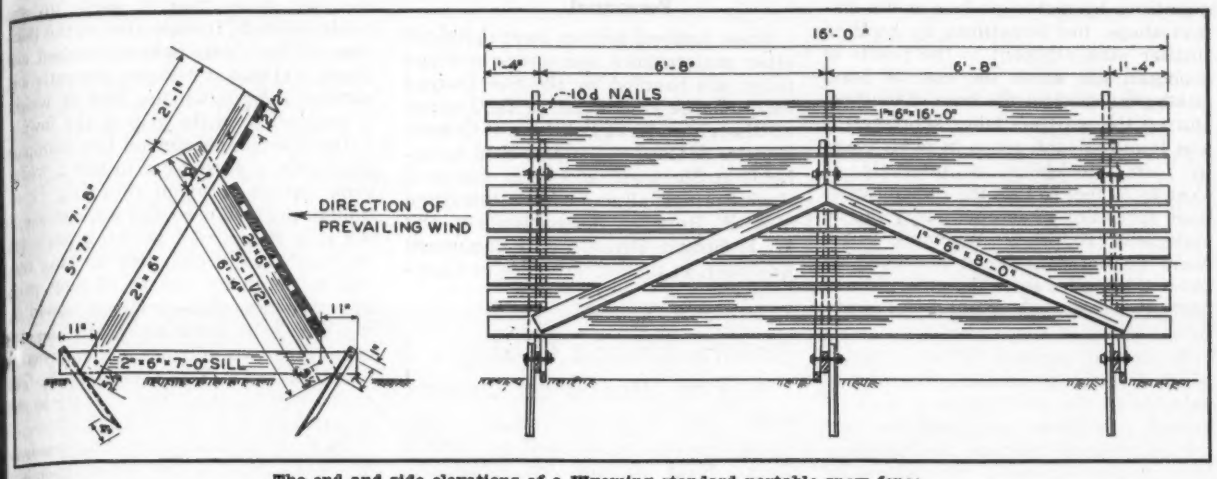

The end and side elevations of a Wyoming standard portable snow fence.

Winter Problems

(*Continued from preceding page*)

the light dry snow refuses to stay plowed. Snow thrown clear of the highway continues to blow back across it so that even after the storm has subsided, continual snow plowing may be necessary for as much as two weeks.

Theoretically, this procedure should keep all roads open continuously, but the problem is, unfortunately, not as simple as that. Storms frequently follow each other at close intervals and there are enough of the excessively heavy storms to keep the snow-removal organization hard at work throughout the winter. Extremely low temperatures seldom accompany the heaviest storms, the usual temperature being from 20 to 30 degrees, although there have been heavy snow storms with a temperature as low as 20 degrees below zero. Because of long distances between towns, the light amount of traffic on many roads during snow storms, and the tendency for the wind to re-cover a road which has been opened, it is out of the question to keep all roads passable at all times. The main highways are kept open, except when blowing snow makes visibility zero.

Shelter Cabins and Radio

In particularly critical locations, shelter cabins have been erected on the right-of-way for passengers of cars caught on the road during snow storms. These buildings are usually of frame construction covered with roofing paper and vary in size, although 8 x 10 feet is approximately the average. All are equipped with coal stoves, and a fair supply of coal is placed inside the cabins in the early autumn. These shelter cabins have prevented serious discomfort, if not death, to many travelers on the Wyoming highway system and not infrequently furnish most welcome shelter to officials and workmen of the Highway Department itself.

The long distances between telephones make two-way radio communication particularly valuable in Wyoming and before the war this improvement had been undertaken and partly developed. Five broadcasting stations have been placed in operation, and the automobiles of all District Maintenance Engineers and the central-office staff are equipped with two-way radio communication. The war prevented the completion of these plans so that only a few crew foremen have radios in their trucks and none is available on the snow-plow equipment. When radio equipment again becomes available, it is planned to equip all snow units and all cars used by the Department with sending and receiving sets.

Snow Fences

Although prevailing winds during a snow storm are usually from the west in Wyoming, the same is not true of the winds which follow the storms. Since these winds are likely to cause even more drifting than the winds coming with the storm, the proper placing of snow fences is a problem which can be solved only through observation and experience. They are to be found set at any angle on either or both sides of roads running in any direction.

The popular lath fence is used frequently in Wyoming and, before the war, many of these were set on steel posts. Others are built with treated-timber posts or native pitch pine. These fences are not taken down in the summertime except in the few areas where farming operations make their removal necessary.

Another type of snow fence used in Wyoming and ordinarily included as a bid item on contracts for new construction is a timber framework built in 16-

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C.H.&E. CONSTRUCTION EQUIPMENT

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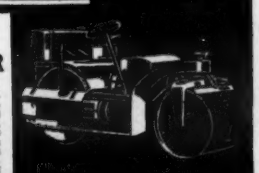

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•This PLYFORM Calculator contains construction data for building concrete forms of Douglas fir plywood. The slide-rule form of the calculator makes this data almost instantly available—at a glance.

•Send for your PLYFORM Calculator today. Priced at $1 for normal sale, this handy calculator will be furnished to engineers and contractors in the United States for 10¢ to cover mailing expenses. Just address your request to the Douglas Fir Plywood Association, Tacoma 2, Washington.

•Remember that PLYFORM offers many advantages as a concrete form material. Made with highly water-resistant glues, PLYFORM is manufactured in large, strong, rigid panels—yet it is light in weight and easy to handle. It possesses superior nail-holding qualities, resists buckling and warping, is easily worked by hand or power tools. Best of all, it provides a smooth-textured surface—and can be re-used many times. As many as 15 re-uses have been reported!

•There is an interesting booklet available — "Concrete Forms of Douglas Fir Plywood." If you do not already have a copy, ask for one when you send for your Calculator.

Every panel of Douglas fir plywood PLYFORM carries a distinctive green edge-sealing and a diamond-shaped "green trade-mark". Douglas fir plywood is available today on priority. Application for allocation must be made by the supplier to the War Production Board.

DOUGLAS FIR PLYWOOD
LARGE. LIGHT. STRONG.
Real Wood PANELS

DOUGLAS FIR PLYWOOD ASSOCIATION
Tacoma 2, Washington

Winter Problems

(*Continued from preceding page*)

foot sections. Each section consists of three ribs of 2 x 6-inch timbers nailed together to form an isosceles triangle, with the one timber towards the road extended 2 feet 1 inch beyond and above the apex of the triangle which is 5 feet above the base. These three frames, one at each end and the third in the center of a 16-foot section, are connected with 1 x 6-inch timbers nailed parallel to the 16-foot length of the section on the off-road arm of the triangle and up the extended portion of the other arm. The 16-foot sections are fastened to the ground by 2 x 4-inch stakes but can be easily removed for shifting their position or transfer to other locations.

Another type of temporary fence, which has proved helpful in preventing re-drifting of snow removed from the roads, is made of 1 x 6-inch verticals 4 feet long, set at 12-inch centers and connected by 1 x 6-inch longitudinal runners. These temporary fences are set in the tops of drifts already formed outside of the right-of-way or on its outer edges and are effective in preventing return of snow to the road.

Ice Control

Since little difficulty is encountered in Wyoming with alternate freezing and thawing during the winter, the control of ice is confined primarily to the sharp curves on the mountainous roads. Coal slack is considered a most effective medium, so in the vicinity of Casper, Sheridan, Rock Springs, and Kemmerer, where coal slack is available, it is used exclusively. It is spread both by hand and by spinner-type spreaders mounted on slowly moving trucks.

In areas where coal slack is not available, pit-run sand with the oversize screened out is stockpiled at strategic locations during the summer and early fall. This sand is mixed with 100 pounds of calcium chloride per cubic yard. This is frequently done in large quantities by motor graders at the district shops, but sometimes by hand in smaller piles adjacent to the points of proposed use when the cost of hand mixing is less than the item of hauling. During the wartime labor shortages, it was found advantageous in many cases to form stockpiles at intervals as close as 50 feet so that the difficulties of hand spreading in an emergency can be materially reduced. Wyoming engineers do not consider it necessary to cover these piles since the chloride will prevent freezing at ordinary temperatures.

It has been found in Wyoming that it is not advisable to use too much calcium chloride in the sand mixture since, if enough is included completely to melt the ice covering the road, the light snow blowing back on top of the melting ice soon builds up a fresh coating more slippery than that which the first application relieved. The most effective mixture is one which serves merely to embed the sand thoroughly into the existent ice.

Personnel

Snow removal and ice control, like all other maintenance operations in Wyoming, are handled by the five District Maintenance Engineers: A. G. Gardner at Cheyenne; W. B. Schilling at Casper; Charles E. Gard at Lander; H. E. Langheldt at Sheridan; and R. G. Stapp at Rock Springs; all under the supervision of J. R. Bromley, Superintendent, and W. E. Sutton, Division and Equipment Engineer, in the central office at Cheyenne.

Safety Lifting Clamp For Plates or Drums

The new Volz flat-surface lifting clamp recently announced by Merrill Bros., 46-18 Arnold Ave., Maspeth, L. I., N. Y., is designed to facilitate the lifting of light or heavy plates, barrels, drums and similar containers, welding assemblies, or any other metal with sufficient flat surface to enable the jaws of the clamp to engage it. The manufacturer states that it picks up and holds securely, irrespective of the position of the clamp when attached and lifted, and that it releases instantly and automatically when the load or weight is relieved from the grip of the jaws.

This clamp operates on two clamping principles, a pressure grip and a wedge grip, which prevent slipping, even though the load is coated with grease or oil, it is stated. All working parts are enclosed in a strong drop-forging casing, to eliminate danger of bent parts by exposure. One jaw is actuated on the cantilever principle, while the stationary jaw is of special construction which allows a strong wedge grip. The entire device, from the shackle to the gripping jaws, is drop-forged.

These Volz lifting clamps are made in four sizes, ½, 1, 3, and 6-ton capacities and will handle thicknesses up to 2 inches. Comparatively light in weight, the clamps are individually tested to double their rated load prior to shipment. Further information may be secured direct from the company.

Junior RAPID PAVEMENT CONCRETE BREAKER

Fastest Pneumatic Method
Cuts Cost and Time
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Good for all Small Jobs

Ask about our
HEAVY-DUTY TYPE

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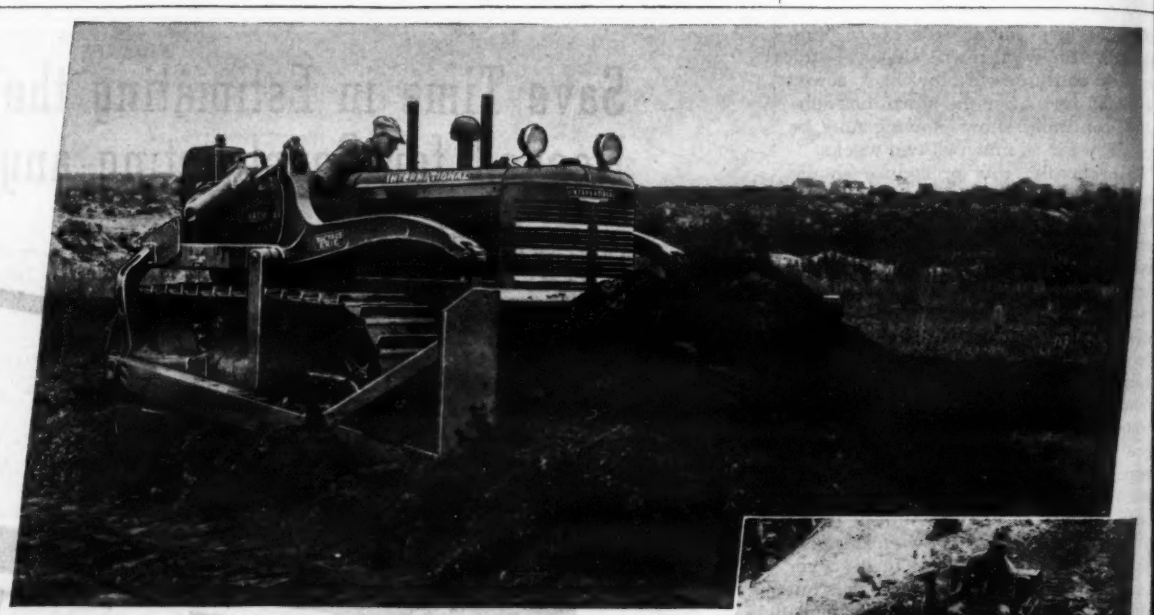

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***and the Power is* INTERNATIONAL**

International TracTracTors demonstrate how engine horsepower of a prime mover is effectively delivered to the bulldozer, scraper, ripper, wagon, etc. Through better balance by better weight distribution, plenty of push and pull is available for every piece of equipment designed for use with TracTracTors.

Operators like the way Internationals handle—their sure-footed traction—their maneuverability. And owners like the way Internationals stay on the job with minimum maintenance—their low operating costs, easily replaceable parts and overall durability—and the way they speed up the work cycle in earth moving, for example.

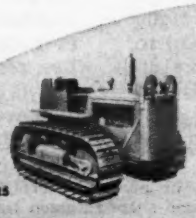
Get set for the projects ahead. Let an International Industrial Power Distributor recommend the kind and size of International TracTracTors, Industrial Wheel Tractors, and Power Units best suited for the jobs you have.

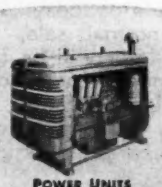
Industrial Power Division

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

The upper picture shows an International TD-18 Diesel TracTracTor equipped with bulldozer moving a big bite of dirt on a highway project.

The smaller picture shows an International TD-9 Diesel TracTracTor nudging a large rock out of its way so the road can go through.


TRACTRACTORS


POWER UNITS

WHEELED TRACTORS

INTERNATIONAL *Power for Victory*

Industrial Power *Power for Peace*

Shovel Companies Name Foreign Sales Director

The Shovel & Crane Division of Lima Locomotive Works, Inc., Lima, Ohio, and the Michigan Power Shovel Co., Benton Harbor, Mich., have jointly announced the appointment of Hugh H. Buchanan as Director of Foreign Operations for both firms. This arrangement will provide a complete line of shovels, cranes, and draglines, both crawler and truck-mounted, in sizes ranging from ⅜ to 5 yards, for world markets.

Mr. Buchanan, who is well known in the industry, until recently was Vice President and General Sales Manager of the LaPlant-Choate Mfg. Co., of Cedar Rapids, Iowa, and brings to his new position a knowledge of foreign sales and development gained from years of contact with users and dealers all over the world.

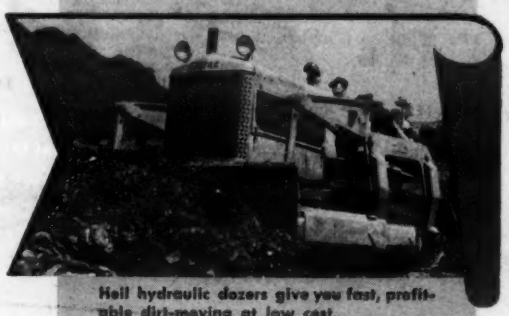
U. S. Motors Brochure

An attractive 33-page book just received from U. S. Motors Corp., Oshkosh, Wis., manufacturer of engine-driven electric plants, reviews photographically the organization, production, and personnel of that company. The many interesting photographs show the progress of U. S. motors and generators from the assembly lines to the shipping department, with detailed illustrations of the finished products, as well as personnel, distributors throughout the country, and highlights in the company's war production, including presentation of the Army-Navy "E".

Copies of this brochure are available on request to the company.

HEIL HI-SPEED
Bottom Dump Wagon

The Heil "engine mounted" Cable Dozer doing a fast job of tree-dozing.



Heil hydraulic dozers give you fast, profitable dirt-moving at low cost.

Heil Hi-Speed Cable Scraper is interchangeable with Bottom Dump Wagon—one power unit.

gives you big capacity . . . a seventeen yard load— and Hi-Speed hauling . . . up to 27 miles per hour

With the Heil Hi-Speed Trailer Wagon, you cut hauling costs — increase digging output — and reduce maintenance expense. Here's why:

1. Saves loading time — big capacity cuts spotting delays; big open top speeds loading cycle.

2. Cuts hauling time—quick maneuverability with hydraulic power steer; wide tread, low center of gravity, and high hitch point gives stability for safe operation while traveling up to 27 m.p.h.

3. Speeds dumping — power opening doors on clamshell principle give full opening and pull up entirely out of the way while dumping.

4. Turns short and fast — non-stop turning radius 19 feet. High clearance permits turning directly off the windrow.

5. Reduces weather delay — big tires, well-distributed load, a powerful engine, easy maneuverability — keep this wagon going through all kinds of weather.

6. Doubles as a scraper—The 15-yard Heil Hi-Speed Scoop is quickly, easily interchangeable with the dump wagon equipment. By using both scraper and dump wagon, with one power unit, you save capital investment, increase your job capacity, and fit your equipment to lowest cost operation on any dirt moving job.

R-52

ARMY E NAVY

SEE YOUR HEIL DISTRIBUTOR

THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

Wet Soil Is Problem In Airport Grading

(*Continued from page* 1)

mum of 50,000 cubic yards of solid rock in the 280 acres included in the graded area.

The boring log issued with the proposals showed soils, ranging from A-4 to A-7 and thoroughly saturated, having an average moisture content of 30 per cent in the undisturbed cuts with some of the material containing as high as 60 per cent moisture. Since 21 per cent proved to be the maximum moisture content at which satisfactory compaction was obtainable, with the optimum ranging between 10½ and 13 per cent, it is readily apparent that the drying of the material was the major difficulty encountered in prosecuting the work. It has been necessary to evaporate 450,000 gallons of water each day in order to secure compaction.

The topsoil, varying in thickness from 6 inches to 1 foot, was first removed and stockpiled for future use, after which the opening of cuts, ranging in depth to as much as 31 feet, was commenced. It was immediately apparent that most of the dirt would require heroic measures for reduction of its moisture content before it could be compacted to the 90 per cent modified Proctor density required.

One of the fills, into which went much of the excavated material, was inverted in shape from those customarily encountered, since it was only 100 feet wide at the bottom (in an old stream bed) and 3,000 feet wide at its top, 50 feet higher in elevation. Even though this fill was 4,000 feet long, it did not provide sufficient working area in the lower portions to permit drying the earth as rapidly as it could be delivered and spread. It was found advantageous, therefore, to dry it in the cuts before movement. This was done by the use of many types and a large number of pieces of equipment. These included three Caterpillar 12 motor graders, pull blades, and five Rome disk harrows pulled by Minneapolis-Moline wheel tractors, and by crawler tractors.

After the moisture content of the material had been reduced on the larger working areas available in the cuts, the dirt was moved by sixteen LeTourneau scrapers, pulled by Caterpillar RD8 tractors, and ten LeTourneau Super C Tournapulls powered by Cummins diesel engines. The dirt was spread in 9 or 10-inch loose lifts and compacted to the specified density by sheepsfoot rollers. An average of eight double-drum units, loaded with sand to various weights, and having varied tooth lengths and areas, were used, and 8 unit-hours were ordinarily required per 8-inch compacted layer for the acceptable compaction of each acre of fill. In the earlier stages of the construction it was frequently found impossible to compact a layer properly until lower lifts, previously compacted, had been loosened and re-worked. In addition to the equipment mentioned above, eight Caterpillar RD8 tractors, two D7's, and two D4's were used as pushers and to pull the equipment used for drying the material in the cuts.

Between July 3, 1944, when work was commenced, and December 15, 1944, when operations were suspended for the winter, 1,250,000 cubic yards of earth had been moved and successfully compacted.

Personnel

The contract for the construction of the Dubuque Airport, authorized under the DLAND appropriation, was awarded by the Kansas City Fifth Regional Office of the Civil Aeronautics Administration to McVaugh-Haynes Co., Detroit, Mich., on the low bid of $1,245,000 on June 26, 1944. This bid was for Schedules 3 and 4 of the project, No. 3 covering the grading and No. 4 the storm sewers and subdrains. Construction of the drainage work was sublet to Thompson Construction Co., of Indianapolis, Ind., by the general contractor. The project is under the personal supervision of both Edwin McVaugh and George H. Haynes. Phil Payne is General Superintendent, with George Munson and Warren Curtis serving as Superintendents. For the Civil Aeronautics Administration, M. H. Price is Resident Engineer, working under the direction of the Fifth Regional Office at Kansas City, Mo.

Pittsburgh Dealer Moves

The Atlas Equipment Corp. of Pittsburgh, Pa., has moved its general offices, and repair, service, and rental departments to new quarters at 635 Ridge Avenue. This equipment distributor is exclusive representative for the Thew Shovel Co., Euclid Road Machinery Co., Buffalo-Springfield Roller Co., Rogers Bros. Corp., Littleford Bros., C. H. & E. Mfg. Co., Owen Bucket Co., Page Engineering Co., International Harvester Co. (Industrial Division), Bucyrus-Erie Co. (Tractor Attachments), Iowa Mfg. Co., Worthington Pump & Machinery Corp., W. F. Hebard Co., Heil Co., and J. D. Adams Co.

Atlas is headed by Paul B. Reinhold as President and Treasurer. John L. Baird is Vice President, and Lawrence B. Cummins, Secretary and Sales Manager.

A Good Safety Notice

This notice appears at the gate of one organization: "We have a Job to Do *Safely* Together. Safety on Construction and the efficient and proper conduct of the work itself are inseparable. Let Us All *Think* for the Safety of Ourselves and Our Fellow Workers."

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Seattle, Wash. — Northern Commercial Co.
CANADA
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Toronto — W. L. Ballentine Co.
Vancouver, B. C. — B. C. Equip. Co., Ltd.
Winnipeg — Kane Tractor & Equip. Co.
Saskatoon — Richardson Road Mach. Co.
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Bulletin 2036, just off the press, is a condensed [illegible] age of comprehensive data on the various items Blaw-Knox Construction Equipment. You will find valuable guide for making a profit on jobs that have built under modern specifications and in a hurry! the coupon for a copy of Bulletin 2036.

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BLAW-KNOX DIVISION OF BLAW-KNOX COMPANY PITTSBURGH
BULLETIN

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ARMY NAVY

CRUSHING MACHINES · STEEL FORMS · CONCRETE BUCKETS · CLAMSHELL BUCKETS

N. J.-N. Y. Parkway Along the Hudson River

A new interstate highway from the New Jersey end of the George Washington Bridge, which spans the Hudson River between New York and New Jersey, to the New York-New Jersey state line 12 miles farther north is planned as a post-war project by Spencer Miller, Jr., State Highway Commissioner of New Jersey. Commissioner Miller has requested $90,000 from the Public Roads Administration to aid in planning this new Palisades Interstate Parkway, towards which the New Jersey Legislature has already authorized a similar sum for surveys and plans.

The New Jersey section of the parkway will be 12 miles long and will cost about $4,500,000, while the continuation to Bear Mountain in New York State would cost an additional $14,550,000, according to preliminary estimates.

LeRoi Co. Organizes Foreign Sales Dept.

The establishment of a Foreign Sales Department and the appointment of William F. Huggins as its Manager have been announced by the LeRoi Co., Milwaukee, Wis., manufacturer of portable air compressors, engine-generator sets, and heavy-duty engines. The functions of the new department will be to direct all international sales and service distribution, with emphasis upon service facilities, through distributors in all of the principal markets of the world.

Mr. Huggins was formerly associated with Powers Export Division of Remington-Rand, Inc., in Argentina; with the Foreign Economic Administration in Washington; and with the South American Commercial Co. of Milwaukee. In his new position he will be located at the general and administrative headquarters of the company in Milwaukee.

New Tournatrailer Folder

Use of the Tournatrailer for hauling from shovel or dragline is described and illustrated in a new 4-page folder recently issued by R. G. LeTourneau, Inc., Peoria, Ill. Prepared for equipment owners and operators, this folder shows how the Tournatrailer can cut the cost of hauling rock and other material, and points the way to a wider range of work through Tournapull changeability with Tournatrucks, Tournatrailers, Tournacranes, and Carryalls.

Free copies of this Form No. TR-106 may be secured direct from the manufacturer by mentioning this review.

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The only self-aligning Paving Form for Airports and Roads . easy to set and keep perfectly aligned . sturdily braced and reinforced for maximum rigidity . . . write for Catalog 2037. Modern Steel Forms for every type of street work such as curb, combined curb and gutter, integral curb, sidewalks, etc., are completely described and illustrated in Catalog 1859.

FINISHING MACHINES - - - PAVING SPREADERS

The record smashing performances of these two outstanding machines should be carefully studied in estimating or planning any concrete road or airport paving project . . . Paving Vibrator attachments available for spreader or finisher . . . Catalogs 2045 and 2046 respectively contain the information you need on Finishing Machines and Paving Spreaders.

BINS AND BATCHERS

Portable Batching Plants for aggregates and bulk cement . . . Truckmixer Loading Plants . . . Central Mixing Plants . . . Manual and Automatic Weighing Batchers for aggregates, cement and water . . . Bulk Storage Bins for aggregates, cement, lime, coal, cinders and all granular materials . . . complete plants, large or small, standard or tailor-made.

CONCRETE BUCKETS - TAMPING ROLLERS - TURNTABLES

The unique and efficient Blaw-Knox Roller Gate Concrete Bucket . . . controllable discharge . . . easy to operate . . . types for normal and low slump concrete . . . sizes one to eight cubic yards . . . Catalog 1816. Another type of concrete bucket with clamshell discharge gate in ½, ¾ and 1 cubic yard sizes . . . Bulletin 1870. Sheepsfoot Tamping Rollers of the full oscillating type for compacting embankments . . . Bulletin 1736. Blaw-Knox Portable Truck Turntables for turning trucks in restricted spaces . . . Bulletin 1822.

CLAMSHELL BUCKETS

Blaw-Knox is Clamshell Bucket Headquarters . . . the right type and size bucket for any service or crane . . . over 100 models to choose from in rehandling, general purpose, hard digging and dredging types . . . Write for Catalog 1757.

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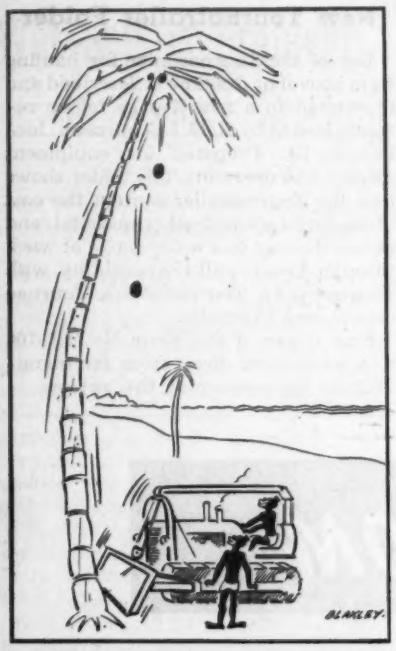

Equipment Business In Post-War Years

Eight major factors are sure to contribute to sustain prosperity in the construction-machinery industry, according to Ed R. Galvin, President, Tyson Bearing Corp., Massillon, Ohio. Mr. Galvin presented these points recently in a speech on "The Outlook for the Construction-Machinery Industry" before the New York Society of Security Analysts. These factors are:

1. Important improvements in equipment resulting from intensive military use of construction machinery.
2. Greatly expanded foreign markets, resulting from wide-spread "sales demonstrations" by our armed forces' construction battalions as well as from building programs in foreign lands.
3. The vast backlog of road construction work that has accumulated during the war.
4. The existing shortage of new road machinery.
5. Our competitive advantage through control of patents.
6. A domestic demand that warrants volume production.
7. The absence of reconversion problems in the construction-equipment industry.
8. The existence of adequate merchandising outlet and factory-trained service man-power.

Mr. Galvin's address has been printed, complete with diagrams, in a 16-page booklet which may be secured without cost by writing direct to Mr. Galvin and mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Robins Reorganizes Its Sales Department

In preparation for more intensive sales activity, Robins Conveyors Inc., Passaic, N. J., manufacturer of materials-handling equipment, has reorganized its Sales Department, which continues under the direction of Harold Von Thaden, First Vice President.

Under the new plan, E. C. Salzman, Vice President, formerly in charge of sales, assumes responsibility of all export operations, including dealings with foreign affiliates and agents. His headquarters will be at 70 Pine St., New York City.

Moving to Passaic from the Chicago office, which has been under his charge, J. F. Meissner, Vice President, takes over control of all Engineering Sales and of the Field Engineers who devote their time and attention solely to the design and engineering of materials-handling projects and plants. The Equipment Sales section is now under A. E. Conover, formerly Manager of the Vibrating Machinery Division. His responsibilities include the direction of the Field Engineers who concern themselves with the sale of equipment.

Sales Research and Training have been put in the charge of T. W. Matchett, Secretary of the firm; Advertising and Sales Promotion remain under E. M. Perrin; and the Engineering Department continues to be headed by R. W. Eichenberger, Vice President.

A vastly expanded sales program has progressed beyond the planning stage, this company reports, and is being instituted as rapidly as additional personnel becomes available.

New Triple-Purpose Electrode Announced

A new combination type of welding electrode designed to produce horizontal fillet welds with flat or slightly concave profiles and concave fillets in the flat position, as well as satisfactory deep fillet and deep groove welds, has been announced by Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y. Usual applications for this new electrode include heavy machine welding; structural assemblies such as trusses, built-up girders and connections; and practically all heavy steel assemblies where high weld quality is important.

This Airco No. 315 electrode has a steady, forceful spray-type arc. The thick porous slag which completely covers the weld deposit under practically every condition is readily removed. The electrode may be used with conventional technique, employing normal currents, under which conditions medium penetration is obtained. Deeper penetration is secured, however, when the deep fillet technique is used with the high currents recommended for this procedure.

Further data on this new electrode, together with costs, may be secured direct from the manufacturer by mentioning this descriptive text.

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Such as Dipper Teeth, Trencher Teeth, Gear Blanks, Levers, Tie Rods, Cranks, Crank Shafts, Special Shapes, etc. Forging weight range from 1 to 50 pounds.
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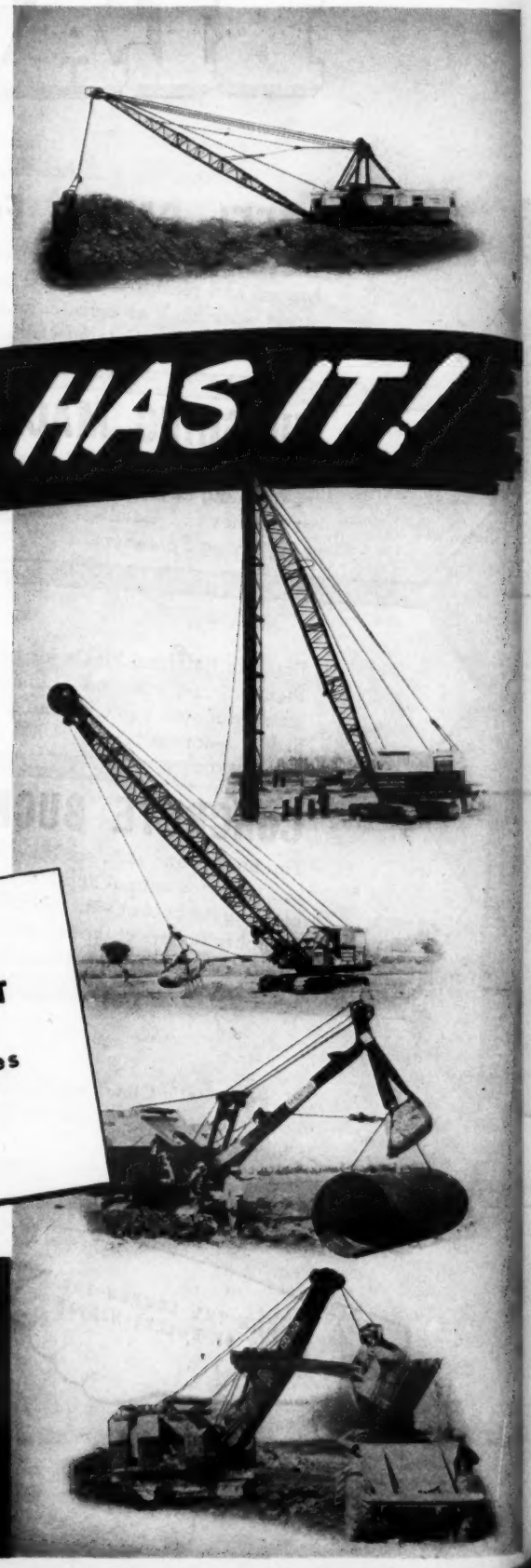

Avoid Legal Pitfalls

Edited by A. L. H. STREET, Attorney-at-Law

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

When a Per-Diem Damage Clause Will Not Be Enforced by the Courts

A contract to construct piers for a toll bridge specified that the owner-city could retain from the sum due the contractor $250 for each day the job remained uncompleted after a fixed time. There was considerable delay, but the bridge was finished at least thirty days before completion of one of the approach roads. So, use of the bridge was not delayed by the pier contractor. Under these circumstances, the United States Circuit Court of Appeals, Fifth Circuit, decided that the owner-city was not entitled to retain the $250 per diem. (Massman Construction Co. v. City Council of Greenville, Miss., 147 Fed. 2d, 925.)

When the pier job was finished, the city authorities withheld more than $20,000 under the per-diem clause, and the contracting company sued to collect. The city won in the trial court, but the company won on an appeal taken to the Circuit Court of Appeals. The higher court said, in part: "'All dressed up and nowhere to go,' the bridge sat unutilized thirty days or more after its full completion, so that the delay by" the contractor "did not cause a delay in beginning the operation of the toll bridge, with the attendant losses for non-operation which the contract sought to provide against."

Foundation of the Decision

The decision by the Court of Appeals was influenced by the fact that the damage clause mentioned that a "delay in completion will cause interference with traffic and losses, such as lost earnings," etc. However, the court rested its decision principally upon the fact that the contractor's delay in performance caused no damage. Therefore, it seems probable that the decision would have been the same had the contract contained no recital as to consequences that might follow delayed completion.

All courts seem to recognize as fundamental these rules of law: A breach of contract does not entail liability in damages in excess of the aggrieved party's actual loss. Where a breach will cause actual loss, but the circumstances are not such as to permit precise or approximate computation of actual damages, the courts will uphold a clause which fixes a specific sum as the amount of damage to be paid, if that amount does not grossly exceed actual loss. But where the actual loss can be computed, or where a sum specified by the contract clearly and grossly exceeds actual loss, the clause will not be upheld. For stronger reasons, the clause should not be applied where there is no actual loss.

Circumstances Fortified Decision

There were additional factors in this case which helped clinch the decision in favor of the contractor. First, the Court of Appeals said that if the contractor had been misled by the owner-city as to subsurface conditions, thereby entailing delay and extra work, that fact should be considered in determining whether it would be just to enforce the per diem clause. This was so even if the contractor could not collect extra pay or damages on account of the extra work, because the contract required the contractor to make its own investigation as to subsurface conditions and stated that the city did not warrant conditions to be as shown by data supplied by it.

The second factor that favored the contractor was the circumstance that the city's engineers, who could have extended the time for completing the pier job, recommended that the city withhold claim of damages on account of the delayed construction because the delay resulted from conditions beyond the contractor's control. The City Council passed a resolution adopting that recommendation on condition that Federal agencies approved. The Court of Appeals decided that these circumstances showed a binding admission by the city that the contractor was not at fault.

The Federal Labor Act And Its Applications

The judicial trend towards construing industrial activities as involving interstate commerce in such way as to render them subject to Federal legislation is illustrated by a decision lately rendered by Judge Schoonmaker of the United States District Court for the Western District of Pennsylvania in the case of Walling v. McGrady Construction Co., 60 Fed. Supp. 243. However, the decision is subject to review in either or both of two higher courts—the United States Circuit Court of Appeals or the United States Supreme Court. Therefore, the results of such appeal or appeals as may be taken in the case are to be awaited. But Judge Schoonmaker cites numerous decisions of the highest courts of the land as justifying his conclusions, which we summarize as follows:

Although governmental employees are excepted from the provisions of the Fair Labor Standards Act, the exemption does not extend to government contractors. "No reason appears why contractors for the Government are to be permitted to maintain substandard labor conditions which private contractors are prohibited from so doing. . . . Nor does the fact that the economic burden of complying with the Act might be carried on to the state, and to political subdivisions thereof, constitute a valid objection to complying with the Act."

The Act covers employees of a highway contractor engaged in maintaining and repairing roads and bridges located in industrial areas devoted to production of goods for interstate commerce. The United States Supreme Court has declared: "Vehicular roads and bridges are as indispensable to the interstate movement of persons and goods as railroad tracks and bridges." This is so, even if the same roads and bridges are also used for intrastate traffic.

The same consideration applies to employees of a contractor engaged in maintaining and repairing the terminal facilities of interstate motor carriers, and to employees engaged in repairing railroad switching facilities, etc., serving industrial plants engaged in interstate commerce.

There is no distinction between maintenance of facilities and the improvement or extension of them.

The Right to Unscramble Bonded Material Accounts

Some recent litigation in Georgia suggests the importance of segregating accounts for materials, etc., used on a construction project covered by a contractor's bond from those relating to a project not covered by the bond, although, excepting for possible claims against the surety, there may be no disadvantage in blending the accounts. It is possible that in some jurisdictions the courts would not reach the conclusion, adverse to the surety, that was reached in the Georgia cases.

In United States Guarantee Co., defendant-appellant, v. Colonial Oil Co., plaintiff-appellee, 145 Fed. 2d, 496, decided by the United States Circuit Court of Appeals, Fifth Circuit, the oil company sued on a highway contractor's bond covering one project. But the oil company had furnished

(*Concluded on next page*)

THE NEW POSTWAR

Sportsman

Here is the first picture of the new Sportsman hand mower which we predict will make a great name for itself among highway departments.

Built of pressed steel it is light weight, easy to handle, quiet . . . and because it is engineered properly to close tolerances, it *shears* the grass and does not tear it.

You are going to like the Sportsman. It is a fine mower and one that your men will enjoy using. We intend to build it in large quantities and sell it at favorable prices.

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Watch for Post-War Models

Avoid Legal Pitfalls

(*Continued from preceding page*)

materials for two projects for this contractor and kept but a single account covering both. Gasoline was delivered into a single tank used in fueling equipment for both jobs. Oil and grease were also taken from a common supply. Some months later the contractor and the oil company's representative went over the company's books and divided the charges between the two projects, although there was no claim that there could be an *exact* apportionment.

In the United States District Court for the Southern District of Georgia, judgement was awarded in favor of the oil company (Colonial Oil Co. v. United States Guarantee Co., 56 Fed. Supp. 545) over the surety company's objection that the oil company was bound to prove just what materials went into the project covered by the bond. The Circuit Court of Appeals upheld the decision.

Both courts agreed that since the apportionment of charges was made on estimates of the contractor who was constantly on the job, and there was nothing to show that the apportionment was influenced by any bad faith or fraud, the amount charged to the bonded job was prima facie correct. The surety, having failed to show that the apportionment was not fair or substantially correct, could not complain of an award in accordance with the accounts finally stated on the oil company's books.

The courts applied a well settled rule of law that admissions made by the principal of a bond in good faith can be shown as some, but not conclusive, evidence as to the surety's liability.

The opinion of the Circuit Court of Appeals cites similar conclusions reached by the Georgia Court of Appeals where a bond covered but one of three highway construction jobs, and where claims were made for repairs, etc., on equipment used interchangeably on all the jobs. (Motor Supply Co. v. St. Paul Mercury & Indemnity Co., 70 Ga. App. 808, 29 S. E. 2d, 640.) In that case it was decided to be proper to apportion the charges on a percentage basis, because "there was evidence that the three projects consisted of the same type of work and that the amount of work done by the various trucks and machines on one job would be the same as on the other, varying only as to the size of the job."

Contracts for Equipment, Are They Leases or Rentals?

Contracts under which an owner of equipment furnishes its use to a contractor often involve important legal consequences depending upon whether the particular agreement amounts to a *lease* under which possession passes to the contractor or whether the contract merely provides for *use* of the equipment without the contractor securing complete control. This point is well illustrated by a case decided by the United States Circuit Court of Appeals, Ninth Circuit, Stockton Sand & Crushed Rock Co. v. Bundensen, 148 Fed. 2d, 159.

A contractor engaged in dredging a channel for an outfall sewer arranged with the rock company for use of its derrick barge, to be furnished by the company on an hourly charge basis, which included services of an operator and fireman, and water, fuel, oil, and insurance. While the barge was being so used by the contractor, a fire was caused by an explosion in the barge's boiler firebox, due to carelessness of the fireman. The rock company sued the contractor for the amount of the resulting damage to the barge, on the theory that the contractor was lessee of the barge and that the fireman was under its control.

The Court of Appeals upheld conclusions of the trial judge, to the effect that the contract did not amount to a lease and that the barge at all time remained under the control and management of its owner, the rock company. This was so even though the contractor selected the fireman, having done so at the request and as agent of the rock company; and even though the fireman's wages were paid, in the first instance, by the contractor, who, however, deducted the amount from the sum due to the rock company for use of the barge.

Contractor's Liability For Injury to Motorists

The law reports indicate frequent laxness on the part of road construction foremen in the matter of warning travelers of dangerous conditions existing while a job remains incomplete but while travel is permitted.

An illustration of circumstances under which the contractor is apt to be held liable for damages is furnished by a case passed upon by the Georgia Court of Appeals. (Doby v. W. L. Florence Construction Co., 32 S. E. 2d, 527.) The plaintiff, a motorist, sued the defendant, a highway contractor, for injuries resulting under the following stated circumstances: The motorist had used the road in question every day while it was under construction. There was a sign at the side of the road warning that the road was under construction, but there had been no barricade. During the daytime preceding the motorist's driving along the road after dark, an unlighted barricade was erected across the road about 100 feet beyond the sign. While he was driving at a speed of 25 or 30 miles an hour, the barricade suddenly loomed up before him and he was injured in attempting to avoid collision with it. The barricade consisted of three posts to which were attached boards about 4 feet above the surface of the road.

The Court of Appeals ruled that the motorist would be entitled to recover damages if, upon a trial, he should prove his claim that, due to the nature of the barricade, including inconspicuous coloring, height of the boards, etc., he excusably failed to discover the unlighted obstruction in time to have avoided the accident.

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The green color identifies I.P.S. The all-green rope guarantees highest character because it signifies TRU•LAY *Preformed of Improved Plow Steel.*

●TRU•LAY was the original preformed rope. Its I.P.S. grade was identified by one green strand. Now the whole rope becomes green for the superior new green lubricant is literally "stuffed" into every strand to identify and protect this highest grade rope. There is nothing better nor longer wearing than TRU•LAY Preformed Improved Plow Steel—the all-green rope. Make certain your next wire rope is TRU•LAY all-green.

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A CAPITOL LOAD

ONE CAPITAL ROGERS TRAILER

MOST of the notable heavy equipment moves of the past were made in Rogers Trailers—the world's battle fields are spotted with Rogers Trailers moving guns, tanks, etc., to and from front lines — and now there are improved Rogers Trailers to meet the needs of a greatly advanced postwar era.

ROGERS BROTHERS CORP. ALBION, PENNA.

This new power take-off makes possible many types of compact truck-mounted units.

A New Power Take-Off Has Wide Application

A new power take-off direct-connected to a truck motor and eliminating the conventional V-belt drive, which was designed and built by A. Tangen, 3269 Hogarth St., Detroit, Mich., comprises a compact set-up and provides a convenient and efficient means for making readily available various power applications wherever they are required. One of the many uses to which this new power take-off has been put is that of driving the generator for a Lincoln arc welding outfit.

The power take-off can be quickly installed as a permanent set-up in any standard truck, and as easily be removed or reinstalled in a few minutes. Built as a unit, the driving mechanism fits directly over the standard transmission case of the truck and does not interfere in any way with the normal use of the truck. Power is transmitted direct from the motor. The governor is driven from the power shaft, and therefore automatically engages or disengages with the power take-off.

The outfit is available as a kit with complete instructions for mounting, or it can be installed in the truck, on order, by the manufacturer. Further information on this new power take-off may be secured by interested contractors and state and county highway engineers direct from A. Tangen.

New Raybestos Plant Produces New Material

A new plant for the manufacture of full-metallic friction materials has been built and is now in operation by the Raybestos Division, Raybestos-Manhattan, Inc., Bridgeport, Conn. Full-metallic products have a wearing surface comprising a bronze matrix which bonds together various friction-augmenting agents and lubricants. They have been used largely on tanks and ordnance equipment, but their post-war use will include the truck, industrial, and heavy machinery fields.

Raybestos makes many types of friction materials for brakes and clutches.

Complete line of
gasoline, pneumatic and electric driven
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New Design Standards For Secondary Roads

The Planning and Design Committee of the American Association of State Highway Officials has recommended minimum design standards for the construction and maintenance of secondary and feeder roads, under the Federal Highway Act of 1944.

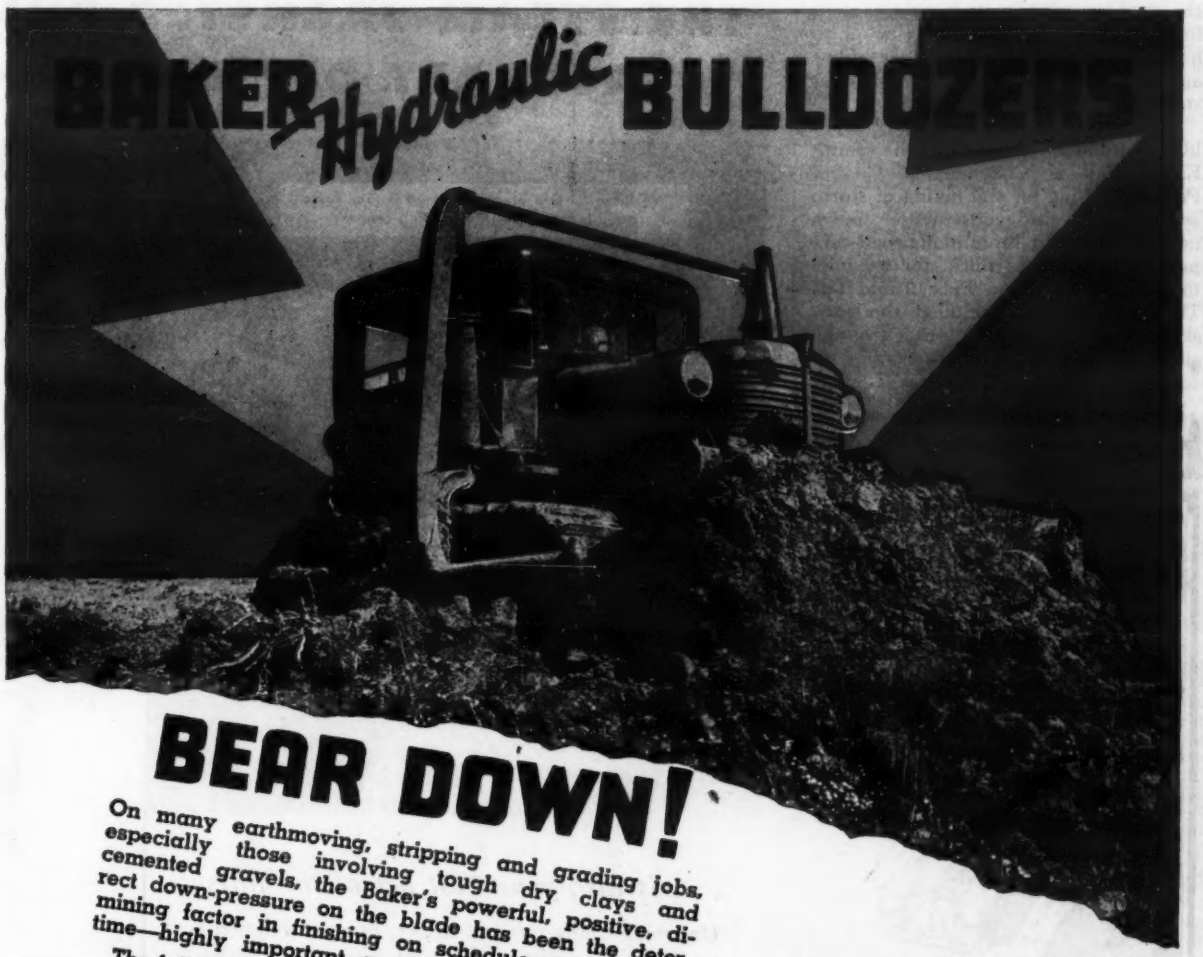
The recommendations define these design standards as the set of values or controls to be used for minimum design, but not necessarily for exceptional cases for which values will need to be decided separately. However, the standard design values or controls should be recognized as "near-minimum" rather than "desirable" values. Standards are established for three ranges in volumes of annual average daily traffic. These volumes are assumed to be the present traffic volumes or those estimated to occur when the improvement is completed. It is desirable that these standards be used for volumes which allow for future increases in traffic. The design peak hour traffic density is assumed to be approximately 10 per cent of the annual average daily traffic. These recommendations apply only to traffic volumes up to 1,000 vehicles. For routes carrying more than that volume, the standards for the Federal-Aid highway system are recommended.

The minimum design standards as proposed by the Committee are given in the accompanying table.

Minimum Design Standards

Design Control	Annual Average Daily Traffic Volume: Under 100 Minimum	Under 100 Desirable	100 to 400 Minimum	100 to 400 Desirable	400 to 1,000 Minimum	400 to 1,000 Desirable
Design speed, mph.:						
Flat topography	40	....	45	55	50	60
Rolling topography	30	....	35	45	40	50
Mountainous topography	20	....	25	35	30	40
Sharpest curve, degrees:						
Flat topography	14	....	11	7	9	6
Rolling topography	25	....	18	11	14	9
Mountainous topography	56	....	36	18	25	14
Maximum gradient, per cent:						
Flat topography	8	5	8	5	7	5
Rolling topography	12	7	10	7	8	6
Mountainous topography	15	10	12	9	10	7
Non-passing sight distance, [1]feet:						
Flat topography	....	....	315	415	350	475
Rolling topography	....	....	240	315	275	350
Mountainous topography	....	....	165	240	200	275
Width of surfacing or pavement, feet	12, if any	....	16	20	18	20
Width of roadbed, feet	20	....	24	28	26	30
New bridges:						
Clear width, feet	14	20	22	24	24[2]	....
Design load, AASHO	H10	H15	H15	....	H15	....
Bridges to remain:						
Clear width, feet	....	....	15	....	18	....
Safe load, posting basis, tons	....	....	6T	....	10T	....
Width of right-of-way, feet	40[3]	....	40[3]	80	50	80

1 As defined in "A Policy on Sight Distance for Highways".
2 Minimum of 24 feet or 4 feet more than approach-pavement width.
3 Minimum of 40 feet or as required for construction.



BEAR DOWN!

On many earthmoving, stripping and grading jobs, especially those involving tough dry clays and cemented gravels, the Baker's powerful, positive, direct down-pressure on the blade has been the determining factor in finishing on schedule—or ahead of time—highly important on war construction jobs.

The full weight of the tractor front end can be brought to bear on the blade forcing it to cut in—the operator need not depend upon the weight of the blade or gravity to force it into a cut.

Baker hydraulics offer all the other desirable features —fast reaction, high moldboard lift, all-weather operation, ease of maintenance (what little is needed).

Why not figure on having Baker *hydraulic* Bulldozers "bear down" on your postwar jobs?

THE BAKER MFG. CO.
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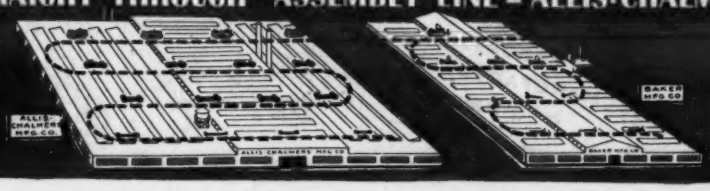
If it concerns Victory, it concerns us!

BAKER They Go Together A-C

BAKER SHEEPSFOOT TAMPING ROLLERS

- Full oscillating rollers that follow contour of ground.
- Rugged frame and rollers that withstand abuse.
- Tamping feet have replaceable weld-on toes.

"STRAIGHT THROUGH" ASSEMBLY LINE – ALLIS-CHALMERS TO BAKER TO YOU!



The modern Baker plant with its completely equipped fabricating, machining and blacksmithing shops adjoins the Allis-Chalmers crawler tractor plant. When you order an A-C tractor with Baker bulldozer or gradebuilder, your tractor leaves the A-C assembly line, crosses a narrow court and goes on the Baker final assembly line.

New Road, Sewers In War-Boom Town

Storm Sewers and New Road-Mix Paving Laid by Smith; Sanitary Sewer and Water Lines, FWA Job

✦ PRIOR to 1939 the little fishing and summer resort town of Fort Walton, located on the Gulf of Mexico in northwestern Florida, had a population of a few hundred people. Since 1939, when the Army Air Force started work on its huge Eglin Field, 10 miles to the northeast, the population of this town rapidly increased until today it is numbered in the thousands. The existing water supply and the sewerage system of Fort Walton were hopelessly inadequate to meet the demands of the increased population, and while the 20-foot pavement laid through the main thoroughfare of the town in 1931 was still in fair shape, it was not wide enough to handle existing traffic. These conditions are now being corrected through joint state and Federal construction.

The State Road Department of Florida awarded a contract to the Smith Engineering & Construction Co. of Pensacola, Fla., for the laying of storm sewers and the construction of a new 40-foot sand-bituminous road-mix pavement, 6 inches thick, for 0.9 mile through the town on Fla. 10 and 115. This contract also included the construction of concrete gutters, curb, and sidewalks, which work was sublet to the Noonan Construction Co., also of Pensacola.

Storm Sewer

Work on the Smith Engineering & Construction Co. contract started on January 11, 1945, with the laying of the storm sewer. Trenches were dug between the edge of the existing road and the sidewalk by a Lorain 40 dragline with a 45-foot boom and a ¾-yard Page bucket. The average width of trench was about 18 feet at the top and from 8 to 10 feet at the bottom, while the depth varied from 5 to 14 feet. This wide excavation was necessary not because of the size of the pipe, which ranged from 18 to 30 inches, but to prevent caving of the sand banks, as the water table is only 5 feet below ground level in this seacoast area.

The excavation from the trenches was piled along the side of the road, while the side of the trench nearer the sidewalk was lined with sheeting to keep the walk from sliding into the hole. The sheeting consisted of 2 x 6 boards, 8 feet long, pointed with an axe. The point of the sheeting was driven by an 8-pound wooden maul to 1½ feet below the flow line of the pipe. The trench was unwatered by a 4-inch Jaeger Sure-Prime pump.

C. & E. M. Photo
Storm sewer trench in Fort Walton, Fla., was dug by a Lorain 40 dragline with a ¾-yard Page bucket.

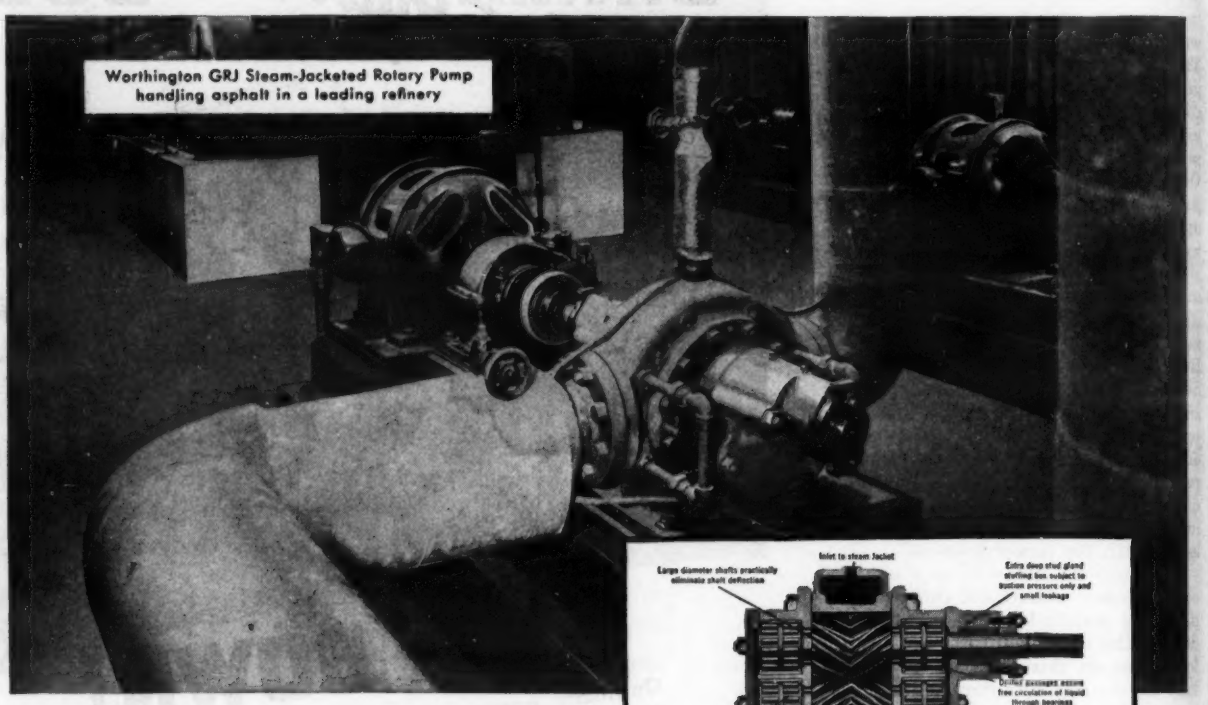
The 4-foot lengths of 30-inch concrete pipe were laid by the dragline, but the lengths of 18 and 24-inch concrete pipe were lowered into the trench by hand from the sidewalk side. The joints were sealed with portland-cement mortar, and the trench backfilled by a Caterpillar RD7 tractor, equipped with a LaPlant-Choate bulldozer, pushing the spoil bank into the trench in 8-inch layers where it was compacted by hand tamping.

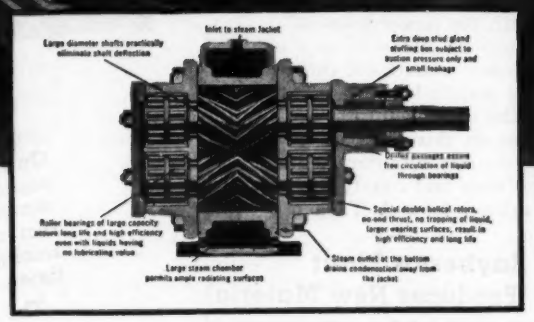
Road-Mix Pavement

When work on the storm sewer was completed at the beginning of April, the temperature had risen to the 70 degrees required for the start of the sand-bituminous road-mix pavement, 40 feet wide and 6 inches thick. The existing 20-foot pavement, also a sand-bitumi-

(Continued on next page)

THE STEAM-JACKETED PUMP THAT GETS ASPHALT OFF TO A GOOD START




Inlet to steam jacket
Large diameter shafts practically eliminate shaft deflection
Extra deep stud gland stuffing box subject to suction pressure only and small leakage
Drilled passages assure free circulation of liquid through bearings
Special double helical rotors, no-end thrust, no trapping of liquid, larger wearing surfaces, result: in high efficiency and long life
Steam outlet at the bottom drains condensation away from the jacket
Large steam chamber permits ample radiating surfaces
Roller bearings of large capacity assure long life and high efficiency even with liquids having no lubricating value

. . . is also your best bet at the finish

One thing contractors and refiners have in common is whole-hearted respect for the in-built stamina of Worthington Steam-Jacket Rotary Pumps. As a matter of fact, many contractors don't even know that Worthington GRJ Rotary Pumps are installed right in their road oilers, pavers, and trucks. That's because these dependable asphalt handlers have a habit of staying out of trouble . . . so never call attention to themselves.

That's why you'll want to have these same trouble-dodgers keeping asphalt on the go from tank cars to storage tanks to tank trucks to the machines that apply it.

GET ALL THE FACTS

For vital facts a contractor should know about Steam-Jacketed Rotary Pumps for handling asphalt, write for Bulletin W487-B11. It proves that *there's more worth in Worthington. Worthington Pump and Machinery Corporation, Harrison, N. J.*

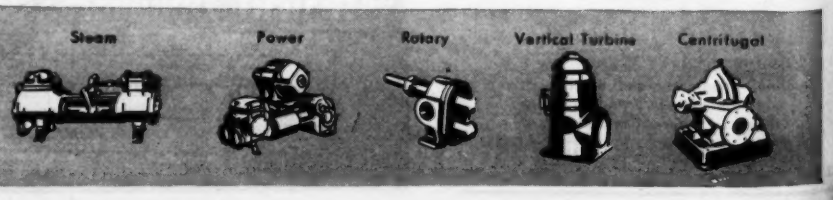
WHY WORTHINGTON GRJ ROTARIES CAN TAKE IT

1. **ROLLER BEARINGS** with more capacity than any other rotary pump.
2. **STUFFING BOX** much deeper than the average.
3. **SPECIAL DOUBLE HELICAL ROTORS** with larger wearing surfaces, free from end-thrust.
4. **HUSKY SHAFTS** mean trouble-free stuffing boxes.

WORTHINGTON

P 5-18

THE WORLD'S LARGEST MANUFACTURER OF PUMPS



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- FLEXCELL is the *approved* modern expansion joint material for all highway and general concrete slab construction. Its long, springy Celotex cane fibres compress under pressure—spring back when the expansion pressure is eased.
- FLEXCELL never extrudes. Keeps highways smooth, protects them against cracking and buckling. That's why it prolongs road service and gives longer highway life.
- FLEXCELL is light, easy to handle. It can be set flush or set below the slab surface with poured capping. It's proved its worth by years of service in American roads—with "never a bump in a million miles."

Write for sample and complete information.

THE CELOTEX CORPORATION
Dept. CEM 9, Chicago 3, Illinois
World's Largest Manufacturers of
BITUMINOUS FIBRE EXPANSION JOINT MATERIAL

C. & E. M. Photo
To unwater trench for new pipe lines in Fort Walton, Fla., the contractor installed a Moretrench wellpoint system.

New Roads, Sewers

(Continued from preceding page)

nous road-mix, was removed except for an 800-foot strip at the west end of the project which was left in place because its grade fitted in with the new drainage plan for that area. The old pavement, which was removed to its 6-inch depth as an item of regular excavation, was stockpiled for later use. Six inches of subgrade was then excavated, as was also a section 12 inches deep on either side of the existing pavement for a 10-foot width in order to get a cut of 1 foot below grade for the full 40-foot width of new paving.

Blending material, consisting of a good-quality sand with a bearing value of 40 pounds to the square inch, was then placed on the base and a stabilized mixture secured by working it into the old pavement by means of graders, disk harrows, 3-furrow gang plows, and spring-tooth harrows. On top of this 12-inch layer of stabilized sand a 6-inch layer of sand-bituminous road-mix pavement was then constructed by Wood Roadmixers.

The major items of this contract were:

Clearing and grubbing	9.5 acres
Roadway excavation	3,598 cu. yds.
Borrow excavation for blending material	6,193 cu. yds.
Existing pavement excavation	2,726 cu. yds.
Mixing and compacting roadway materials	27,022 sq. yds.
Sand-bituminous road-mix	24,246 sq. yds.
Bituminous material, cut-back asphalt	145,476 gals.
Concrete-pipe culvert, 18-inch	2,064 lin. ft.
Concrete-pipe culvert, 24-inch	1,351 lin. ft.
Concrete-pipe culvert, 30-inch	812 lin. ft.
Concrete curb and gutter	9,120 lin. ft.
Concrete sidewalk, 4-inch	2,366 sq. ft.
Concrete sidewalk, 6-inch	6,360 sq. ft.

This contract was awarded to the Smith Engineering & Construction Co. of Pensacola on its bid of $67,891.63 by the State Road Department of Florida, of which J. H. Dowling is State Highway Engineer. The work was done in Division 3 of which H. H. McCallum is Division Engineer and G. L. Dickenson is Assistant Division Engineer with headquarters at Chipley. J. S. Hall was Project Engineer on this contract, which was scheduled for completion about the middle of this summer, and F. Poyner was Inspector. A. W. Gordon was Superintendent for the Smith Engineering & Construction Co., while R. A. Britt was Superintendent for Noonan Construction Co. of Pensacola, the subcontractor on the gutter, curb, and sidewalk, which were laid after the work had been completed on the sewer and water lines.

Sanitary Sewer

The contract for laying the water mains and the sanitary-sewer lines was awarded to the Williford Plumbing & Heating Co. of Troy, Ala., by the Federal Works Agency. Work on the sanitary sewer started on November 20, 1944. The trench was excavated to depths of 4 to 12 feet by a Byers dragline using a 40-foot boom and a ¾-yard perforated bucket. The width of trench varied according to the depth and the stability of the soil which had a strong tendency, because of the high water table, to cave in and fill up the trench. To insure the pipe's being laid on a stable foundation, a dry ditch was necessary, but with the water table only 5 feet below ground level the trench had to be unwatered as most of the pipe is located below water level.

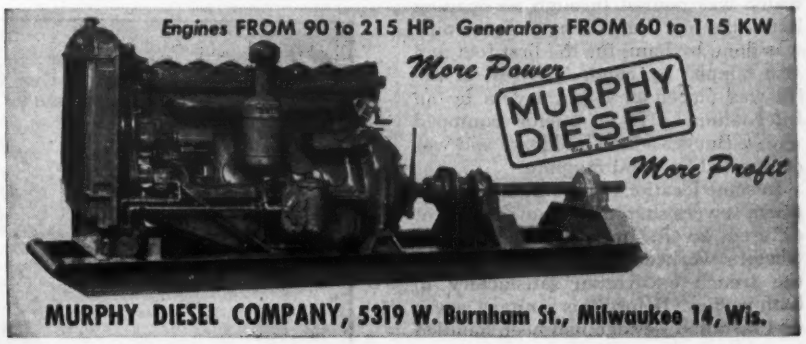
Accordingly, a Moretrench wellpoint system was installed with a 6-inch header line running along one side of the trench at the edge of the sidewalk. The header pipe came in 20-foot lengths with 800 feet of pipe in use and an additional 400 feet being taken up and moved to new locations as the job progressed. The risers, which were jetted into place with water pumped from the excavation, were 2 inches in diameter and 14 feet long, and were spaced 4 feet on centers, connected to the header pipe with swivel joints. Pumping was done by two Moretrench pumps powered by 4-cylinder Hercules gas engines. The vacuum on the line averaged 23 inches. The pumps were mounted on four steel wheels and could be readily shifted as required. The 6-inch discharge line from each pump was about 80 feet long and emptied into a storm sewer which discharged into the nearby bay. One pump had a capacity of 1,000 gpm while the other could pump 600 gpm; each handled 400 feet of header line.

The sanitary-sewer lines are divided into two gravity systems, each of which leads to a pumping station which pumps the sewage to the central treatment plant. The total length of pipe in the system is as follows:

Vitrified-clay pipe,	10-inch	5,500 lin. ft.
Vitrified-clay pipe,	8-inch	12,000 lin. ft.
Vitrified-clay pipe,	6-inch	4,000 lin. ft.

The 6-inch pipe is for service lines running from the street pipe to the property line where the owner of the house completed the connection. The

(Concluded on next page)



MURPHY DIESEL COMPANY, 5319 W. Burnham St., Milwaukee 14, Wis.

does double duty

99-M LOADER
Reduces Investment in Equipment
...Handles a Variety of Jobs

• COMBINING, in one machine, the ability to grade and load, the "99-M" Loader is deservedly popular with both contractors and highway departments.

In the upper picture, the Loader is picking up a windrow of sod "pulled" from the ditch, and, at the same time, stripping sod from the shoulder.

In the lower illustration, the Loader is performing one of the many small jobs of shallow excavation where neither shovels nor scrapers will operate efficiently or economically.

Your nearby A-W Distributor will be glad to tell you all about this "Double-Duty" machine.

AUSTIN-WESTERN COMPANY • AURORA, ILLINOIS, U. S. A.

ARMY NAVY
BUY MORE WAR BONDS

New Roads, Sewers

(*Continued from preceding page*)

sanitary-sewer pipe came in lengths of 2 and 3 feet and was placed by hand; the bell-and-spigot joints were caulked with G-K compound heated in an asphalt kettle over a coal and wood fire. A runner was placed around the joint which was poured through an opening left at the top. Backfilling over the pipe was done by hand for the first foot and also tamped by hand. The rest of the fill was placed in 2-foot layers by an International TD-14 tractor equipped with a Bucyrus-Erie bulldozer and was compacted by hand tamping.

In some locations the sanitary and the storm sewers shared the same trench at different levels. In such cases the contractors worked out an agreement on the trench excavation satisfactory to both parties. Before this sanitary sewer was installed, sewage had been handled in septic tanks in the houses.

Water Mains

Residents of Fort Walton formerly got their water supply from individual wells, or three or four houses would have a joint system operating on an electric pump. Now the water supply for the entire town comes from an 800-foot-deep artesian well and is carried through 30,000 feet of cast-iron pipe, 700 feet of which is 8-inch and practically all the rest is 6-inch. The bell-and-spigot pipe was laid in trenches ranging in depth from 30 to 36 inches which were dug by a Cleveland trencher. They are generally located between the back of the curb and the sidewalk and kept as far away as possible from the sanitary sewer. House connections varied in size from ¾-inch to 2-inch pipe, and were contracted for separately by the individual home owner. These water-main trenches were backfilled and tamped by hand.

This contract for the sanitary-sewer and water lines, which the FWA awarded to the Williford Plumbing & Heating Co. of Troy, Ala., for $203,500, was completed the latter part of April. L. F. Williford, a member of the firm, was Superintendent of the project. The engineering work on this contract, as well as the construction of the structures, was under the supervision of Smith & Gillespie, Engineers, of Jacksonville, Fla., with J. E. Lamm as Resident Engineer.

This project was financed by the Federal Works Agency, of which O. T. Ray is Regional Director with headquarters at Atlanta, Ga. J. R. Brennan is Senior FWA Engineer for the state of Florida, and G. B. Scott is Construction Engineer.

New Electrode

A new heavily coated electrode which deposits welds of high tensile strength and ductility particularly suitable for heavy plate fabrication, shipyard work, pressure piping, pressure vessels, and general structural steel work has been announced by the Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. This ACP electrode forms a light porous slag which is easily removed from each pass by light brushing; is easy to handle on vertical and overhead work; and is particularly adapted to making horizontal fillet welds and lap joints on all low and medium-carbon steels as well as low-alloy and cast steels.

Designed for speedy and economical welding in all positions and with ac and dc reverse polarity, the new electrode is available in seven diameters from 5/16 inch to 3/32 inch, and meets Navy specifications as well as various association code requirements.

C. J. Foster to Retire; Veteran in Roller Field

After almost fifty years of activity in the road-roller industry, C. J. Foster plans to retire next December as an executive officer of the Buffalo-Springfield Roller Co., Springfield, Ohio. He will, however, continue in an advisory capacity as a director.

Mr. Foster joined the O. S. Kelly Co. in 1898, when that concern built steam road rollers. Later, when the steam-roller division was sold to the Kelly-Springfield Roller Co., he went along to that firm which was the nucleus of the present Buffalo-Springfield organization.

YOUR PROJECTION TOMORROW
LIES IN YOUR ORDER TODAY
Stop and analyze now, your future equipment requirements in the light of two imperative needs. First, — highway reconstruction alone to say nothing of the vast new highway programs, involve an equipment demand that will require as much effort on the part of manufacturers as ever did the demands of war. Second, — time schedules, competition and the magnitude of the task will require equipment engineered to the utmost in capacities and production.
For these reasons, sound, far sighted policy dictates that, — to be assured that the most modern equipment (the finest in high production Engineered Design will be on your jobs when you want them) — your order should be placed now for future delivery—and, of course, placed with Butler.
BUTLER
BIN COMPANY
WAUKESHA, WISCONSIN

THE RUD-O-MATIC TAGLINE

Spring Tension—Less Wear

Maintains positive tension at all times sufficient to steady a clam shell bucket under any conditions. Functions perfectly with boom at any angle.

Operates on a spring principle. There are no weights, tracks, pins or carriages to wear out or get out of order. Large bearing and fewer sheaves save wear on cable.

Tagline is complete with fairlead and cable attached. Can be installed in less than one-half hour.

Most Crane Manufacturers have adopted Rud-o-Matics as standard equipment

★ If Victory Bonds aren't safe, no other investment matters. So buy Victory Bonds with every dollar you can find.

U. S. Army Signal Corps Photo
To cut a canal to link American Lake near Fort Lewis, Wash., with a bowl-like depression, U. S. Engineers used a Le Tourneau scraper pulled by a Caterpillar D8. The newly created bodies of water were used for bridge-building sites.

Illinois State Funds For Township Roads

When Governor Dwight H. Green of Illinois signed Senate Bill No. 327 in July, making it a law, the sum of $15,000,000 was made available from the general revenue fund of the state for surfacing and improving township roads in Illinois. These funds are to be allotted to the counties according to their mileage of township highways in relation to the total mileage of township highways in the state. The funds then are to be allocated to the several townships in the county according to their mileage of township highways in relation to the total mileage of township highways in the county.

This is the first time there has been an appropriation from state funds for the improvement of township roads and it is expected that it will provide a substantial impetus to the development of a system of all-weather farm-to-market roads throughout Illinois.

The new law provides that the county superintendent of highways and the township highway commissioners in each county shall select the township roads to be improved, giving preference to public-school-bus and rural-free-delivery mail routes. The roads designated for improvement are subject to approval by the State Department of Public Works and Buildings. The townships and road districts, at their expense, must provide the right-of-way, do the grading, and build the small culverts. This means that the state money will be used to resurface the township roads to make them dustless and mudless.

An Inflating Solution For Equipment Tires

Air in tires of certain types of industrial equipment, such as road graders, power mowers, and industrial tractors, may be replaced by liquid inflation. The Goodyear Tire & Rubber Co., Akron, Ohio, has announced that after extensive tests approval has been given the use of Solution 100 in tires of vehicles which carry only the weight of the vehicle and travel at relatively slow speeds. In such service, the use of Solution 100 assures increased traction, constant inflation pressure, and in grader tires reduces "chattering" of the blade.

Use of liquid inflation is not recommended for load-carrying tires of trucks, cranes, trailers, and earth-moving vehicles. Increases in internal pressure occur in tires filled with liquid solution in cases where payloads are carried. Speed in excess of 10 miles per hour may cause excessive strains due to increased centrifugal force.

Thousands of specially designed pumps for filling the tubes of tractor tires 100 per cent with liquid solution have been sold by Goodyear within the past few months to Goodyear dealers from coast to coast. Complete information regarding Solution 100 may be secured direct from Goodyear by mentioning this news item.

Dirt-Removal Agent For Machines, Parts

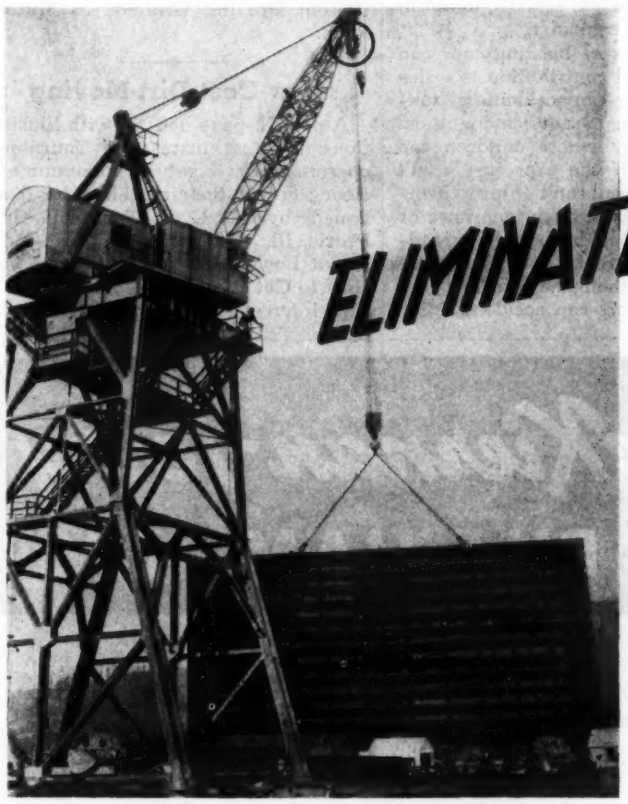
A powerful rapid-penetrating agent for the removal of grease, dirt, and sludge from machines and parts, in preparation for inspection, repair, or repainting, is made by the Kleer-Flo Co., 250 W. 57th St., New York 19, N. Y. Used cold, thus eliminating the delay and trouble of heating, Kleer-Flo is suitable for cleaning all types of metals. The manufacturer states that it will not pit or corrode, will not attack babbitt, solder, or paint, will not roughen aluminum, and will not blacken pot-metal or die casting. It is non-toxic, non-acid, non-alkali, and non-explosive, and there is no harmful chemical reaction on skin or clothing.

Approved by Underwriters Laboratories, Inc., Kleer-Flo comes in 55-gallon drums. Although recommended for Kleer-Flo metal parts cleaning units, it can be used with any system of equipment cleaning in present service in your shop or garage. Further information may be secured direct from the manufacturer, or from this magazine.

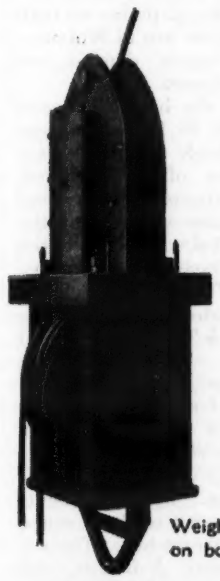
Catalog on Accessories For Drills and Air Tools

Worthington Blue Brute accessories for rock drills and air tools are described and illustrated in a 12-page catalog issued by the Construction Equipment Division of Worthington Pump & Machinery Corp., Holyoke, Mass. Included in the line are moil points, chisels, asphalt cutters, clay spades, tampers, air-line lubricators, air hose, hose couplings and fittings, mountings for hand-held rock drills, and water-tank assemblies and accessories for all wet drills.

Copies of this catalog are yours for the asking. Just address your requests to the manufacturer.



ELIMINATE GUESSWORK
with the
CLYDE CRANE GAGE
(Patent Applied For)



Weighing unit on boom end

The Clyde Crane Gage is a new and scientifically engineered instrument that eliminates all guesswork for your operator while handling loads on any type of crane. No longer will he have to guess at the crane's capacity, at the weight of the load or at the radius of the boom.

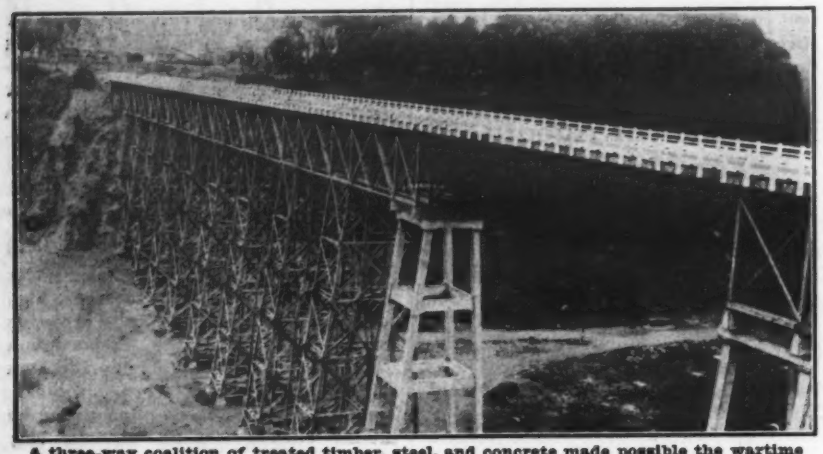
The Clyde Crane Gage shows not only the load and radius but also flashes a red warning whenever the combination becomes dangerous. If the load is within the rated capacity of the crane; green lights give visual assurance of the margin of allowable safety.

The operator does not have to know the weight of the load nor the radius or read the dials. He can work with absolute safety by watching the color of the lights and keeping in the green safe-zone.

Write for special bulletin giving full information.

Dial in operator's cab

CLYDE IRON WORKS, INC.
DULUTH, 1 MINNESOTA



A three-way coalition of treated timber, steel, and concrete made possible the wartime construction of this 969-foot bridge over the Albion River in California.

High Bridge of Steel, Lumber, and Concrete

The wartime construction of the 969-foot Albion River bridge in northern California was made possible by the use of treated timber along with steel and concrete. The tall towers, 115 feet high, have none of the "beefed-up" appearance they would have had if the bridge had been built 20 years ago. Timber connectors, accurately graded timber, and pressure treatment combine nowadays to let the strength of wood be utilized economically, without the old-time allowances for bolted joints and probable weakening from decay.

The $350,000 bridge was built by the California Division of Highways to replace an old span constructed in 1922. The replaced bridge was found to be too light to handle the big loads hauled from the lumber mills to the north. An abandoned logging-railroad bridge yielded up a steel truss which was used to span the main channel; the truss is supported on two concrete towers reinforced by steel rail. Timber towers and trusses supporting the structure on both sides of the main span are of Wolmanized fir, cut to length, dapped and shaped before treatment.

The roadway of the bridge between its timber curbs is 26 feet wide, and double diagonal plank flooring is laid on seventeen lines of 6 x 20-inch stringers on the approach spans and 6 x 18-inch transverse stringers on the steel deck-truss. Wolmanized fir to the amount of 814,000 board-feet was furnished by the Wauna Lumber Co., which had the treatment made at the American Lumber & Treating Co. plant at Wauna.

The huge Albion River span presented a number of problems in erection. Running at a maximum of 140 feet above water level, the bridge required both a crane and a stiffleg derrick for construction. The lower bents for the bridge were set up by a crane working from the stream bed. The remainder of the bents, A-frames, and bracing had to be erected by a stiffleg derrick which worked at deck level, moving out from the river bank as erection progressed.

The steel trusses were assembled and riveted separately on a platform between the two concrete piers. By joint operation of the derrick on the south concrete tower and a crane on the north tower, the trusses were lifted 115 feet into place.

The design was prepared under the direction of F. W. Panhorst, Bridge Engineer, California Division of Highways. The construction was supervised by G. T. McCoy, State Highway Engineer, and Mr. Panhorst.

Guard Your Blasting Caps

In spite of safety campaigns by the Institute of Makers of Explosives, schools, and other agencies, large numbers of children continue to be injured annually from playing with blasting caps which they find near construction jobs, along highways, in open fields and quarries, and sometimes in the home.

Every effort is being made to instruct children *not* to play with these dangerous caps. A new all-color sound motion picture has just been released by the Institute of Makers of Explosives for showing in the public schools, to aid in this educational campaign.

However, users of blasting caps can make a very real contribution to a decrease in blasting-cap accidents by taking especial care in not leaving them around carelessly where children can pick them up. If the caps just aren't there, the children can't injure themselves with them, through ignorance or curiosity. We appeal once more to readers of CONTRACTORS AND ENGINEERS MONTHLY to do their share in the prevention of blasting-cap accidents.

GMC Announces Plans For Technical Center

Believing that modern science is the real source of economic progress and creator of higher standards of living, the General Motors Corp. has announced plans for a new General Motors Technical Center, consisting of a group of buildings which will provide facilities to meet tomorrow's needs for the corporation's research, advanced engineering, styling, and process development sections of its general staff activities. It is pointed out that this new Technical Center will in no way change the General Motors policy of divisional responsibility for each division's own product engineering. The Center will serve purely as a technical fact-finding and experimental development activity.

Construction of these buildings, which will be located on 350 acres just outside Detroit, Mich., will start as soon as clearance on materials and labor can be obtained from proper Government agencies. In addition to the new Center, the corporation has also announced plans for extensive improvements in its present Proving Grounds at Milford, Mich.

Low-Cost Dirt-Moving

A new 12-page booklet with illustrations and text instructing Tournapull operators how to get the maximum efficiency out of their machines has been issued by R. G. LeTourneau, Inc., Peoria, Ill., under the title "Dirt-Moving at Lowest Net Cost per Yard and How to Get It".

Of interest to equipment owners and operators alike, this profusely illustrated folder shows profitable Tournapull applications on roads, airports, dams, reservoirs, railroads, mines, and other heavy-construction jobs. Copies may be obtained by writing direct to LeTourneau at Peoria, and mentioning this review.

Worthington-Ransome Blue Brute Distributors

By referring to the advertisement on page 10, you'll learn the meaning of the (1), (2) or (1-2) beside their names.

Ala., Birmingham (1) J. D. Pittman Tractor Co.
Ariz., Phoenix (2) Smith Booth Usher Co.
Ark., Fort Smith (2) R. A. Young & Son
Little Rock (1) Kern-Limerick, Inc.
Little Rock (2) R. A. Young & Son
Calif., Los Angeles (1) Garlinghouse Bros.
Los Angeles (2) Smith Booth Usher Co.
San Francisco (2) Coast Equipment Co.
Colo., Denver (2) John N. Meade
Denver (1-2) Power Equipment Co.
Conn., Hartford (2) The Holmes-Talcott Co.
New Haven (1) W. I. Clark
Waterbury (1) Contractors Supply Co.
Del., Smyrna (1) King-Burrous
D. C., Washington (1) M. A. Doetsch Machinery Co.
Fla., Jacksonville (1) Julien P. Benjamin, Inc.
Tampa (2) S. M. Regar
Ga., Atlanta (2) Tractor & Machinery Co.
Savannah (1) Morgans, Inc.
Ida., Boise (1-2) Olson Manufacturing Co.
Ill., Chicago (1-2) Chicago Construction Equipment Co.
Chicago (2) John A. Roche
Chicago (1) Thomas Hoist Co.
Ind., Fort Wayne (1) American Steel Supply Co.
Indianapolis (2) Reid-Holcomb Co.
Iowa, Des Moines (2) Electric Eng. & Const. Co.
Ky., Harlan (2) Hall Equipment Sales Co.
Louisville (2) T. C. Coleman & Son
Louisville (2) Williams Tractor Co.
Paducah (1) Henry A. Petter Supply Co.
La., New Orleans (1) Ole K. Olson Co.
New Orleans (2) Wm. F. Surgi Equipment Co.
Maine, Portland (1-2) Maine Truck-Tractor Co.
Md., Baltimore (1) Stuart M. Christhilf & Co.
Baltimore (2) D. C. Elphinstone, Inc.
Mass., Boston, Allston (1-2) Clark-Wilcox Co.
Cambridge (2) W. W. Field & Son, Inc.
Mich., Detroit (1) T. G. Abrams
Detroit (2) W. H. Anderson Co., Inc.
Flint (2) Granger-Hall & Co.
Muskegon (1-2) Lakeshore Machinery & Supply Co.
Minn., Minneapolis (1-2) Phillippi-Murphy Equipt. Co.
St. Paul (2) D. L. O'Brien
Miss., Jackson (1) Jackson Road Equipment Co.
Mo., Clayton (1-2) The Howard Corporation
Kansas City (1) Brown-Strauss Corp.
Kansas City (2) Machinery & Supplies Co.
St. Louis (2) W. H. Reaves
Neb., Lincoln (1) Highway Equipment & Supply Co.
N. J., Hillside (2) P. A. Drobach
Newark (1) Johnson & Dealaman
North Bergen (2) American Air Compressor Corp.
N. M., Albuquerque (2) Bud Fisher Co.
Albuquerque (1) Morrow & Co.
Roswell (2) Smith Machinery Co.
N. Y., Albany (1-2) Milton-Hale Machinery Co.
Buffalo (2) Dow & Co., Inc.
New York (2) Air Compressor Rental & Sales
New York (1-2) Hodge & Hammond, Inc.
New York (1-2) Railroad Materials Corporation
Olean (2) Freeborn Equipment Co.
N. C., Raleigh (2) Carolina Tractor & Equipment Co.
N. D., Fargo (1-2) Smith Commercial Body Works, Inc.
O., Cincinnati (2) Finn Equipment Co.
Cleveland (2) S. M. Clancey
Cleveland (1) H. B. Fuller Equipment Co.
Cleveland (2) Gibson-Stewart Co.
Marietta (2) Northwest Supply & Equipment Co.
Toledo (1) Edmund Supply Co.
Toledo (2) M. W. Kilcorse & Co.
Okla., Oklahoma City (2) Townsco Equipment Co.
Oregon, Portland (2) Andrews Equipment Service
Pa., Allentown (2) H. N. Crowder, Jr., Inc.
Easton (2) Sears & Bowers
Harrisburg (2) N. A. Coulter
Oil City (2) Freeborn Equipment Co.
Philadelphia (1) Giles & Ransome
Philadelphia (2) Metalweld, Inc.
Pittsburgh (2) Atlas Equipment Corp.
Wilkes-Barre (2) Ensminger & Co.
Wilkinsburg (1) Arrow Supply Co.
York (2) George F. Motters Sons
S. C., Columbia (2) Smith Equipment Co.
Tenn., Knoxville (2) Wilson-Weesner-Wilkinson
Memphis (2) Tri-State Equipment Co.
Tex., Dallas (1) Service Equipment Co.
Dallas (2) Shaw Equipment Co.
El Paso (2) Equipment Supply Co.
El Paso (1) Mine and Smelter Supply Co.
Houston (2) Dye Welding Supply Co.
Houston (1) McCall Tractor & Equipment Co.
San Antonio (2) Patten Machinery Co.
San Antonio (1) San Antonio Machine & Supply Co.
Utah, Salt Lake City (1-2) Landes Engineering Co.
Vt., Barre (1-2) A. M. Flanders, Inc.
Va., Richmond (2) Highway Machinery & Supply Co.
Wash., Seattle (1) Columbia Equipment Co.
Seattle (2) Star Machinery Co.
Spokane (2) Andrews Equipment Service
Spokane (1) Columbia Equipment Co.
W. Va., Charleston (1) West Virginia Co.
Fairmont (2) Interstate Engineers & Constr., Inc.
Wisc., Milwaukee (1) Mekeel Engineering Co.
Wyoming, Cheyenne (2) Wilson Equipment & Supply Co.

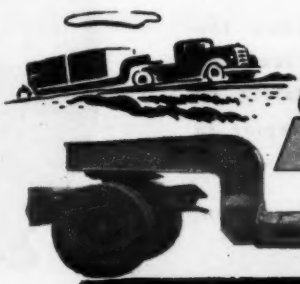
Blue Brute Brutes
Worthington Pump and Machinery Corp.
Worthington-Ransome Construction Equipment Division
Holyoke, Massachusetts

McKiernan-Terry
PILE HAMMERS

For many years McKiernan-Terry Pile Hammers have been the choice of engineers and contractors on major construction projects throughout the world. During the war, they were used widely by Army and Navy Departments for construction and reconstruction work on ports, bridges, dams, etc., in every theatre of operations. To meet these and other heavy demands of the Army, Navy and Maritime Commission, our Dover and Harrison, N.J., plants have been greatly expanded. These enlarged facilities are now available for the many peace-time projects requiring Pile Driving Equipment, Hoisting Equipment, Marine Equipment, Heavy Construction Equipment and/or Specially Engineered Equipment or Machinery.

Write for Bulletin

McKIERNAN-TERRY CORPORATION
19 Park Row New York 7, N. Y.



CARRYHAUL
Trade Mark Registered

FOR TRAILING EQUIPMENT 'CROSS TOWN OR 'CROSS-COUNTRY..WITH ECONOMY

There's a proper size of safe, easy-loading MARTIN TRAILER to hustle light equipment 'cross town —or to highball a giant D8-Dozer 'cross-country—with economy.

Your "CATERPILLAR" Dealer is your MARTIN Dealer. See him for your trailer needs.

Write for Booklet

MANY MARTIN MODELS 5 TO 20 TON CAPACITY

MARTIN MACHINE COMPANY
KEWANEE, ILLINOIS

Tar and Limestone Used for Seal Coat

Thirteen Miles of 20-Foot Bituminous Road Covered In Four Days by State Maintenance Forces

USING trucks which in ordinary times would long ago have been replaced with new vehicles, a state maintenance crew placed a bituminous seal coat on 13 miles of Tenn. 58 northeast of Chattanooga in the creditable time of four days. Factors which aided in the quick improvement of this 20-foot road eastward from the city line early in April were the pre-stockpiling of the cover aggregate during the winter months to insure an adequate supply of stone being always available, and the use of two mechanical loaders to fill the trucks speedily and keep them engaged in spreading the cover mat.

The cover mat consisted of crushed limestone ranging in gradation from ¾ inch maximum down to that retained on a No. 4 sieve, and purchased by the Department of Highways from the Avondale Stone Quarry at Chattanooga. State trucks hauled the stone to the intersection of Tenn. Routes 58 and 2A, a distance of 7 miles from the city line, where it was dumped and stockpiled. This location was about midway of the project so the longest haul from the stockpile to the farthest part of the road under improvement was only 6½ miles.

The bituminous material used was an RT-8 tar, purchased from a local commercial plant in Chattanooga and hauled nearly 16 miles in 800-gallon supply tanks mounted on Chevrolet trucks. Three of these units were employed to feed tar to an Etnyre 825-gallon pressure distributor mounted on an International truck; the tar was transferred from the supply tanks to the distributor by a LeRoi-engine-driven pump located at the rear of the tank on the distributor.

The Treatment Step by Step

Before any material was applied to the road, its surface was cleaned and swept by two Grace rotary brooms. The existing road consisted of an 8-inch chert base, a local material with many of the properties of gravel, to which had been applied a bituminous seal coat of tar and stone five years ago. Using two 5-foot spray bars, the distributor covered half the road with a prime coat of the RT-8 tar applied at the rate of 0.3 gallon to the square yard at a temperature of 180 degrees F. Within four minutes, the distributor emptied its tank on a 10-foot strip ½ mile long, while traffic was maintained on the other half of the road.

At the stockpile two Barber-Greene loaders, powered by LeRoi engines, filled the eight trucks used on this job, consisting of four Whites and the rest of varied makes. Each truck hauled 5 cubic yards of stone and was loaded in 4 minutes. At the rear of the trucks were Gibbes spreader boxes through which the cover mat of stone was spread over 8 feet of the tar at the rate of 30 pounds to the square yard. The trucks backed over the bituminous material, spreading stone as they moved, so that the tires did not come in contact with the prime coat. A laborer perched on the tail-gate controlled the flow of stone through the spreader boxes.

C. & E. M. Photo

Two Barber-Greene loaders at the stockpile of cover aggregate kept eight trucks supplied for the maximum 6½-mile haul to the work. Each truck was loaded with 5 cubic yards in 4 minutes.

The surface was then rolled by two Huber 5-ton 3-wheel rollers after which traffic was permitted on this lane while the other 10-foot half of the road was given a prime coat of tar. On both lanes the stone was spread for a distance of 8 feet from each edge, leaving a 4-foot strip at the center of the road

(Concluded on next page)

LA CROSSE

Heavy Duty Machinery Trailers

MADE IN CAPACITIES 3 TO 200 TONS FOR ANY PURPOSE

LA CROSSE TRAILER & EQUIPMENT CO.

LA CROSSE, WISCONSIN

You CAN take it with you ••

wherever you need *Steam!*

A perfected, highly efficient portable steam generator — on wheels — you can tow this unit with car or truck anywhere you need steam — tank-car siding, construction site, material yard or other location.

In tank-car heating with the Cleaver-Brooks heater you have hot dry steam flowing to the car coils from a cold start in 20 minutes or less. And you can keep going all day with the least work and bother because a Cleaver-Brooks tank-car heater requires less fuel and water. The famous and exclusive four-pass flue travel construction means low fuel consumption; the turbine type condensate return system cuts water loss—every drop of condensate goes back to heater under pressure.

Built for full capacity — full-time work — Cleaver-Brooks tank-car heaters will give you the most in production hours on the job. Wherever in service, Cleaver-Brooks are usually given the tough jobs because of their known reliability.

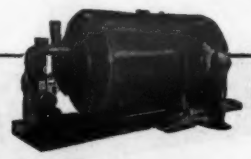
Write today—get bulletins and complete information from Cleaver-Brooks—the pioneers and originators of tank-car heaters and bituminous boosters.

CLEAVER-BROOKS COMPANY

5110 N. 33rd Street • Milwaukee 9, Wisconsin

Automatic Steam Plants

Completely self contained; highly efficient; require only simple piping connections to place in operation. Fully automatic fuel-oil burner; condensate recovery and feed water pumping system; no stack needed, sizes from 20 to 500 h.p.; pressures 15 to 200 lbs.



Hot Water Boosters

Oil-fired; fully automatic or manual operation; no licensed engineer needed; two capacity sizes: 3000 gals. storage tank for 1600 gals. of water heated 150° F. per hour; 1500 gals. storage tank for 800 gals. of water heated 150° F. per hour.

Portable Pumping Boosters

Heats bituminous material by direct firing in one operation, loading directly to distributor, relay truck or returning to tank car. Two sizes, truck mounting or 4-wheel trailer.

Portable Tank-Car Heaters

Available in 2 and 3 tank-car sizes. Oil-fired with exclusive four-pass flue travel; dry-coil steam condensate return under pressure — no water or heat loss. Provides a portable source of steam wherever needed.

Cleaver-Brooks

Pioneers and Originators of ★TANK CAR HEATERS ★BITUMINOUS BOOSTERS ★AUTOMATIC STEAM-PLANTS

Tar and Limestone Used for Seal Coat

(Continued from preceding page)

which was next covered with stone also applied by the 8-foot Gibbes spreader boxes. This excess of stone material serves to cover any bare spots of tar that may turn up.

An average of 3 miles of this type of surface treatment was completed in a 12-hour day. The day following the spreading of the stone cover coat the two Grace rotary brooms were pulled over the road by trucks to broom the loose stone in from the edges towards the center of the road. These brooms have bamboo-type bristles and are 8 feet long and 2 feet in diameter.

Force and Equipment

The maintenance crew was comprised of 20 men in the following capacities: the foreman, a mechanic, the driver and the operator of the pressure distributor, 2 roller operators, 2 loader operators, 8 truck drivers, and 4 laborers used chiefly in loading the trucks and working the spreader boxes.

Gasoline was supplied to the trucks and other equipment from a 295-gallon tank, enough for a day's supply, mounted on an old Plymouth chassis equipped with a manually operated pump. This unit was filled on the road from commercial gasoline supply trucks. Other supplies, such as oil and small spare parts, were carried in a Chevrolet ¾-ton service truck, on the side of which is mounted a 6-inch grinder driven by an old Ford Model T starter operating off the battery of the truck.

The equipment shortage, especially of trucks, is acutely realized by a look at one of the trucks used in spreading stone. This particular piece of equipment was put together in the State Division 2 shop at Chattanooga from parts that were mainly salvaged from the junk pile. Some of the items used in building this truck included a GMC chassis, a Chevrolet engine, a Ford V-8 rear end, and an Oldsmobile radiator. Instead of the rod that is normally used to connect the clutch pedal with the throw-out bearing, a trace chain was employed with satisfactory results.

Personnel

This surface treatment was a project of the Second Division of the Tennessee Department of Highways, with S. M. Squires, Division Engineer, and J. B. Ramsey, Division Maintenance Engineer. Hurl Maynard was Foreman of the maintenance crew. C. W. Phillips is Commissioner of the Tennessee Department of Highways and Public Works and W. T. Brooks is State Highway Engineer.

C. & E. M. Photo

Cover aggregate for a tar seal coat on Tenn. 58 northeast of Chattanooga was placed by Gibbes 8-foot spreader boxes at the rate of 30 pounds per square yard.

Anti-Diversion Vote Authorized in Texas

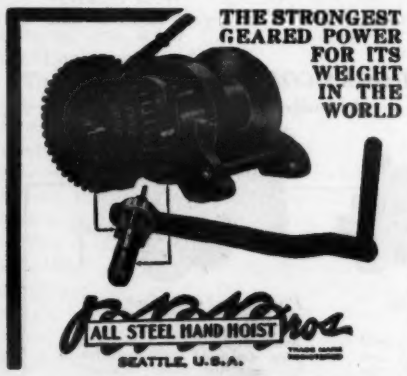
The 49th Texas Legislature, which adjourned June 5, authorized the submission of a constitutional amendment to the voters of Texas to prevent any further diversion of motor-fuel and motor-lubricant taxes and motor-vehicle registration fees to non-highway uses. The Texas Good Roads Association and several other civic organizations were associated in the sponsorship of the amendment. The principal co-sponsors were the Texas County Judges and Commissioners Association and the Texas Rural Letter Carriers' Association.

New Catalog Tells All About Barnes Pumps

A new 22-page catalog on automatic centrifugal pumps has just been announced by Barnes Mfg. Co., Mansfield, Ohio. The book is illustrated with true colors of each model, and its 21 pages contain complete details of the applications of each pump, as well as performance tables.

Four pages of the book are devoted to special construction features of the new line of Barnes automatic centrifugal pumps, giving a complete visual sales presentation. The last section of this new catalog gives simplified information on how to select the right pump for the job.

Copies of this catalog may be secured direct from the manufacturer by mentioning this item.



Compact—Powerful—Safe

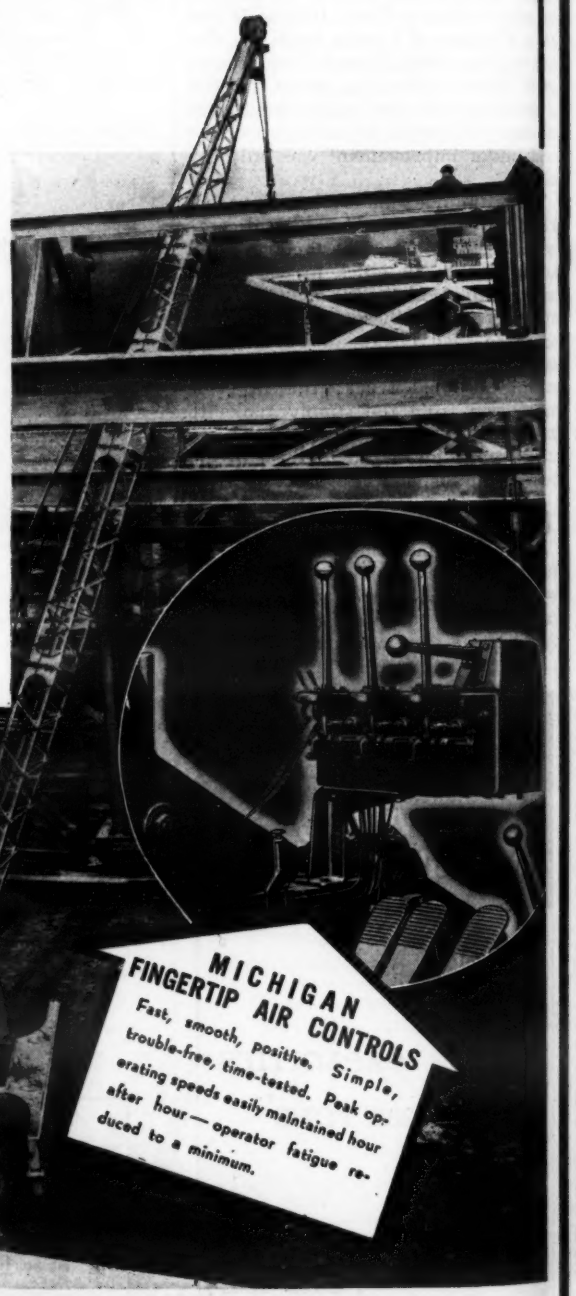
STANDING ROOM ONLY FOR DURATION

Beebe Bros. All-Steel Hand Hoists carry the highest resale value of any piece of equipment in the world. If you have one not in use, sell it. Many more than are available are urgently needed.

BEEBE BROS.
2724 6th Ave., So., Seattle 4, Wash.

STEEL GOES UP F-A-S-T-E-R WITH A MICHIGAN MOBILE CRANE....

To "make time" on steel-setting jobs you need a crane that can ease cumbersome girders and structural sections into position with speed, accuracy and safety. . . MICHIGAN Mobile CRANES are outstanding for operating ease, stability for handling heavy loads with maximum safety, truck mobility, and many other profit-earning features . . . . Construction activity is due to greatly increase in the near future—have **you** modern, cost-cutting equipment which will enable you to **profitably** handle **your** share? It will pay you to seriously consider MICHIGAN Mobile CRANES and SHOVELS—available in 6 to 12 ton and ⅜ and ½ yard capacities, convertible to all standard attachments. . . . Get the facts—write for Bulletin CE-95 today.


MICHIGAN FINGERTIP AIR CONTROLS
Fast, smooth, positive. Simple, trouble-free, time-tested. Peak operating speeds easily maintained hour after hour—operator fatigue reduced to a minimum.

MICHIGAN POWER SHOVEL COMPANY
BENTON HARBOR, MICHIGAN

Selecting Wire Rope For Your Equipment

A very handy booklet which contains many illustrations and a detailed discussion of wire rope for shovels of all types, ditchers, dirt-moving scrapers, front-end loaders, drag scrapers, draglines, clamshell and orange peel buckets, cranes, and dredges, has been issued by the Hazard Wire Rope Division, American Chain & Cable Co., Inc., Wilkes-Barre, Pa. A 2-page table at the end of this 20-page booklet tabulates all types of equipment and services on which wire ropes are used and then gives details as to the proper diameter of rope, number of strands, wires per strand, and all of the other construction features of the wire rope itself for each specific service.

Copies of this booklet may be secured direct from the manufacturer by mentioning this review.

Fire Prevention Week

Fire is our greatest agency of destruction. Against the Japanese, it was one of our most potent weapons of war, but fires here at home are taking a vast toll of lives and property. During the past decade, 6,000,000 fires have occurred in the United States, $3,000,000,000 worth of property has gone up in smoke, 170,000 persons have been burned and disfigured by fire, and 100,000 persons have been burned to death. This tragic waste must be prevented.

Fire Prevention Week, October 7-14, is designated by proclamation of the President and the state governors to focus public attention on the seriousness of fire losses, and the simple measures to prevent fires. If you have neglected the necessary precautions to insure adequate fire protection, why not set aside Fire Prevention Week to correct that oversight? Clear out waste and rubbish, oily rags, and other combustible material from your shops, garages, warehouses, and homes. Have your electrical equipment and wiring inspected. Be sure that sufficient fire extinguishers are available, and properly placed and marked. And give your personnel a little review in fire prevention as well as fire-fighting procedure.

Fire waste in the United States is the highest in the world. This must be stopped.

Industries that are hurt by competition ought to be hurt. Competition not only rewards those who serve society; it also punishes those who do not serve society.

. . . with an Adnun Black Top Paver

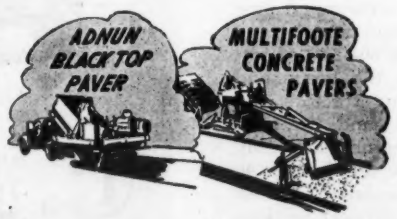
Equipped with a new, more powerful gasoline engine, the Adnun black top paver is winning praise from experienced road-building men all over the country. Husky, economical, this 6-cylinder power plant makes huge, heavily loaded trucks *"pushovers"* for an Adnun. Operating smoothly and efficiently at all speeds, the Adnun handles loaded trucks with ease on any grade . . . while laying the mix according to specifications.

Adnun pavers *remain* in peak operating condition, because they are built for hard service. The rigid, cross-braced frame is more than adequate to absorb the shocks imposed by heavy trucks . . . bearings and shafts are kept in line. Power take-off is through heat-treated, alloy steel bevel gears, fully enclosed and running in oil, mounted on anti-friction bearings. Rear rollers are mounted in cast steel frames and the cutter bar is fully enclosed, can't be bent or warped.

For further details on these new, powerful pavers ask an Adnun owner, see your nearest Foote Distributor or write direct.

THE FOOTE COMPANY, INC.
1916 State Street Nunda, N. Y.
The World's Largest Exclusive Manufacturers of Concrete and Black Top Pavers

ARMY NAVY
ADNUN
TRADE MARK REGISTERED
BLACK TOP PAVER
WITH CONTINUOUS COURSE CORRECTION



Completely portable and designed for extra large production, this Cedarapids Master tandem crushing and screening plant is owned and operated by the Dodge County, Wis., Highway Department. It has a 10 x 36-inch jaw crusher, a 40 x 20-inch roll crusher, and a 4 x 12-foot double-deck vibrating screen, all mounted on a rubber-tired truck.

New Cutting Electrode For Underwater Use

A new and improved type of cutting electrode, permitting increased speed in metal cutting and for use at unlimited depths underwater, has been announced by Ellwood Products Corp., Ellwood City, Pa. Designed so that any unskilled workman can successfully cut metal after only ten minutes instruction, according to the manufacturer, this Ellpro electrode was developed originally to permit the salvage of damaged ships by the U. S. Navy, but it has many applications for underwater use on construction projects.

The Ellpro electrode, which can be used with either ac or dc current, is made of steel in the form of a hollow tube, with an adhesive coating which prevents its sticking to the cutting surface. It is used with oxygen, permitting safety to the worker at any depth underwater. The adhesive coating was developed through cooperation, research, and exhaustive testing with the U. S. Naval Engineering Experiment Station at Annapolis and the Minnesota Mining & Mfg. Co., St. Paul, Minn.

It is stated that with this electrode a molten arc is obtained the instant it is placed against the surface to be cut. A torch holder prevents its burning down to a point where it cannot be removed with ease. As its cutting life ends, it can be simply drawn from the holder and a new one inserted with practically no loss in time.

Further details on the Ellpro electrode may be secured direct from the manufacturer by mentioning this item.

Pipe-Line Engineers Built Submerged Line

A new method of laying submerged pipe line has been achieved by an Engineer Petroleum Distribution Company in the Pacific, and was recommended to other similar units all over the Pacific area. The problem which this EPD Company at an advanced base faced was to bridge a mile-wide gap between an offshore tanker anchorage and empty gasoline storage tanks on shore.

The regular methods of building a timber-pile-supported hose deck would not work, as there was too much mud. Some other means had to be improvised to permit ocean-going tankers to discharge their cargoes of motor fuels directly to the shore storage and distributing pipe-line system. A hydrographic survey showed that the ocean floor sloped gently from the sand beach to almost level mud bottom 30 to 35 feet below low-tide level at a distance of 4,600 feet from the shore. The Engineers decided to construct a submerged pipe line of 8-inch welded steel pipe.

The first obstacle was 600 feet of wet swampy land between the beach and the nearest road. Using tractors and scrapers to haul beach sand, the EPD Company built a combined assembly and launching area 600 feet long x 40 feet wide. On this foundation, timber stringers were laid to support sections of pipe placed at 15-foot centers to serve as supports during assembly and as skids for launching.

Eight-inch steel line pipe was assembled and joined by electric arc welding into 600-foot sections on the ramp. When 4,800 feet of pipe had been welded into 600-foot sections, a bridle of heavy chain was welded to the seaward end of the first section for towing and for attaching a marker buoy. A timber sled was framed around the seaward end of the pipe and the line was ready for launching.

The toughest problem of all was solved with the help of the Navy. A net tender with a winch provided motive power for the launching. Two 12-foot triangular range markers were erected on shore to guide the tender; in addition, blinker-light signal communication was maintained between ship and shore.

When all was ready, the ship was anchored on range. The winch line was run ashore and attached to the towing bridle. The first 600-foot section of pipe was winched out until its shore end came opposite the sea end of the second section. The two sections were aligned with the aid of a winch-equipped 2½-ton truck and joined by two welders working simultaneously to speed the operation. This procedure was repeated until the required 4,600-feet of pipe was launched and floating just beneath the surface. During launching, marker buoys, improvised from large-diameter pipe sections, were fixed to the line at 1,200-foot intervals to mark its course.

When the line was finally launched, the sled at the seaward end was loaded with concrete blocks to sink and anchor it. While a tractor held a slight strain on the pipe to maintain alignment, water was pumped into the pipe to sink the line and the job was done. The total elapsed working time was 8 hours and 25 minutes.

Panama Plans Purchases Of Equipment for Roads

The Public Roads Department of the Ministry of Public Works of Panama is planning the purchase of $278,000 worth of road-building machinery to carry out its 1945-46 highway program.

The Ministry has also recommended that the National government float a $16,000,000 loan to permit the construction of the Inter-American Highway from Rio Hato to the Costa Rican border. This would complete the route from the border to the capital, Panama City.

Servicised Asphalt PLANK "Easy to Lay" for WATERPROOF-PROTECTION-COURSE

SERVICISED ASPHALT PLANK

The use of Servicised Asphalt Plank Protection Course over membrane waterproofing on railroad underpasses, tunnels, and other structures has become standard engineering practice. The membrane must be protected from the wear which it will receive from roadbed ballast in the case of underpasses and tunnels, and from foot traffic in the case of roof slabs.

SERVICISED ASPHALT PLANK HAS BEEN the ANSWER for YEARS

Servicised Asphalt Plank solves the problem because it bears without distortion such unusual loads as railroad ballast, tracking, trains, etc.

A POSITIVE LEAKPROOF COURSE

Being leakproof Servicised Asphalt Plank is non-absorbing, non-decaying therefore unaffected by ice or water and will not crack, split or puncture.

LASTS LONGER! LESS EXPENSIVE

Not only does it cost less to install than mastic protection or similar materials but it assures much greater efficiency and length of service. It provides a tough resilient covering which always adheres to and expands and contracts with the structure of which it is a part.

SPECIFICATIONS—for the use of asphalt plank as a waterproofing protection on railroad structures have been adopted by the American Railway Engineers and published in its manual.

A POSITIVE LEAKPROOF COURSE

SERVICISED PRODUCTS CORP.
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JAHN Heavy Duty TRAILERS in Capacities from 5 to 100 TONS

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• Jahn heavy duty trailers have long been noted for their ability to handle the *tough* hauling jobs. With rugged in-built stamina, they have the strength to take the strains of heavy overloads without distortion. Rigid cross-braced frame, improved goose-neck construction, spring mounted front and rear axles . . . consider all these finer construction details when you are buying a heavy duty trailer. Write today for full information.

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R. I. Takes Big Step With Aerial Survey

Rhode Island is reaping the benefit of an expenditure of $30,000 which it shared with the Public Roads Administration for an aerial survey of approximately 50 square miles along the tentative route of one of the state's post-war expressways. The survey was "shot" last March by Fairchild Aerial Surveys, Inc., in a few hours on one clear day.

A mile-wide strip was photographed from West Greenwich near Nooseneck Hill, where pre-war construction greatly improved State Route 3 from Westerly towards Providence, thence north and northeast through Cowesett, Cranston, Providence, Pawtucket, and Central Falls to the Massachusetts line. One-mile-wide strips parallel to this main area were photographed at Apponaug, Natick, and Pontiac, and a similar strip was taken on the west side of Providence. To complete the survey, two-mile-wide strips running at right angles to the main strip shot were taken from the head of Narragansett Bay across to East Providence and a one-mile-wide strip along the Seekonk River.

By means of the latest scientific instruments, these mosaic photographs have now been corrected for the various inaccuracies of elevation, tilt of the plane, etc., and tied in with known ground distance. To complete this work required about three months of steady application.

Under the old method, a survey of one-fifth the area covered in this project would have taken about four years to complete and would cost approximately $23,000 for 10 square miles. This photogrammetric survey, combined with the recently completed field work on a traffic study made of the Greater Providence area, will form a firm basis for sound post-war highway planning in the Providence area, according to Henry J. McKenney, Engineer of the Providence office of the Public Roads Administration.

Roadside Memorials Along Main Highways

Sponsorship of roadside parks along main highways as memorials to honor those who have given their lives in this war is being sought by the Louisiana Department of Highways from American Legion posts. The Department of Highways will bear all of the expenses of construction and of maintenance of these roadside memorial parks, consisting of a maximum of 4 or 5 acres, which not only will furnish a convenience for tourists, but will also benefit people in the locality by serving as recreational areas.

The Department must, according to law, depend upon donations of suitable sites which must be deeded to the Department. Such sites and the proposed facilities must have the prior written approval of the Louisiana State Board of Health.

A letter addressed to all Legion posts has gone out over the signature of T. Slack, Landscape Architect of the Louisiana Department of Highways, with the approval of D. Y. Smith, Director of Highways, and Harry B. Henderlite, Chief Engineer. Copies of the form of deed which has been prepared may be secured by writing to Mr. Slack at Baton Rouge, La.

HOW A B G BUCKET LOADER KEEPS YOUR TRUCKS Rolling

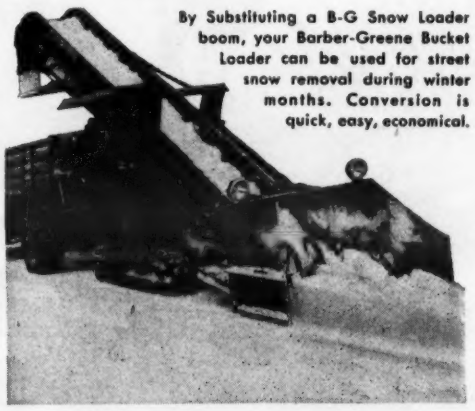
• Cut down their idle time. Keep trucks moving in rapid rotation with a fast feeding Barber-Greene Bucket Loader.

There is no cheaper way to load bulk materials . . . no better way to hold labor costs down.

No time lost getting into position. With its crawler mounting, you can get over soft spots, maneuver in cramped corners easily.

Cutting action across the full width of the feeding spirals keeps the buckets full. Material is delivered at top capacity from stockpiles, natural deposits and during light excavating, stripping, or shoulder shaping. You have twelve crowding speeds to cope with any loading condition.

There are a score of other advanced mechanical features in the B-G Bucket Loader that will help you save money on every material handling job. Write for free literature. Barber-Greene Company, Aurora, Illinois.



By Substituting a B-G Snow Loader boom, your Barber-Greene Bucket Loader can be used for street snow removal during winter months. Conversion is quick, easy, economical.

Barber-Greene B G Constant Flow Equipment

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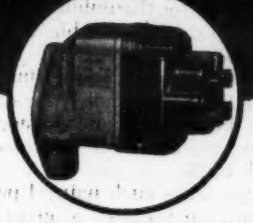

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There is a near-by Fairbanks-Morse Magneto Service Station which is always ready to serve you; write Fairbanks, Morse & Co., Beloit, Wisconsin.

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A Plan to Modernize Boston's Street Maze

Engineers Committee Working With Legislature Commission Hopes to Solve Traffic Jam in World's Most Congested City With Narrow Streets

✦ THE Engineers Committee studying the arterial highway problems in Boston for the Massachusetts Post-War Highway Commission has presented its first progress report, a long step towards a final report, to the Commission, and it is included in the initial overall report of March 29, 1945, which recently became available. The opening paragraph of the Engineers Committee report succinctly sets forth the magnitude of the problem in "The Hub of the Universe".

"In greater Boston we face the most delayed, technically complicated, and concentrated traffic problem in America.

"New York has taken advantage of both the Hudson and East River banks, natural locations, to construct two magnificent thoroughfares providing excellent facilities for the uninterrupted flow of an almost unbelievable amount of traffic.

"Chicago was able to reclaim land on the lake front for one of America's most famous boulevards and throughways, relieving the city of a vast amount of through traffic.

"Boston lacks such natural possibilities, and must chisel a great artery through a maze of narrow, winding city streets, flanked with towering and costly office buildings, industrial establishments, banks, residential blocks, and never-ending cross streets, converging from every conceivable direction. This condition constitutes a problem to traffic engineers perhaps unparalleled anywhere, and cannot be solved without interfering with many established institutions, practices and customs; however, to exist socially, commercially, and economically, Boston must have modern traffic facilities. Traffic is slowly strangling the city and nothing short of a major operation on the traffic situation can avoid serious consequences to its future growth and prosperity."

The first work of the Engineers Committee was the collection and study of all available traffic data and, on the basis of these traffic data and recommendations by the Traffic Subcommittee, the Committee began considering specific projects, detailed location and design, estimated cost, and particularly comparative estimates of cost between various possible solutions.

The area studied is that radiating 10 to 15 miles from the city's center, namely the Metropolitan District, which includes 43 cities and towns, including Boston.

In 1941, the total travel in Massachusetts amounted to 10,300,000,000 vehicle-miles, of which 1,100,000,000 vehicle-miles or 11 per cent of the state total was in the city of Boston, and 2,600,000,000 vehicle-miles or 25.7 per cent of the state total was in the Metropolitan District, excluding Boston. The Boston figures refer to the city as a whole and the travel over all of its 757 miles of streets. The average daily traffic density, which is the number of cars passing any given point in 24 hours, was found to be 4,072 cars. Boston's problem, however, is concentrated in the downtown section where the average daily traffic volume traversing the principal streets, approximately 29 miles, amounts to 145,319,640 vehicle-miles annually, which is an average daily traffic density of 14,000 cars. Several of the streets, however, carry daily volumes as high as 20,000, 30,000, and 40,000 cars, in contrast to the average of 14,000 cars. The inadequacy of these downtown-Boston streets to carry these volumes efficiently is the cause for this study.

For the congested downtown section of the city, the results of a cordon check made of this section three years ago revealed that in this particular area 66 per cent of the traffic originated in places beyond the city limits, indicating that the bulk of the traffic coming to Boston has its destination in the business area or passes through that area en route to places north, south, or west.

Boston's Central Artery

The Engineers Committee has agreed that a new north-south facility entering Boston via the Charles River Dam and proceeding southerly is necessary to relieve the congested conditions in the downtown retail, office, and market districts. The existing streets are being used to capacity and even if parking were eliminated entirely and a freer flow of traffic was thus accomplished the results would be only temporary and partially satisfactory. The antici-

(*Continued on next page*)

Where roads look better, are safer and cost less to maintain—look for
TUTHILL GUARDS
TUTHILL Guard makes roads safer, look better and cost less to maintain. Strong steel, convex panels are cut to convenient lengths for quick, easy, economical installation. Rounded end pieces finish the job—make it look neat, attractive. Built for visibility . . . safety . . . economy . . . TUTHILL gives it! Available for complete installation. Request details.
Pacific Coast Manufacturers and Distributors: U. S SPRING & BUMPER CO., Los Angeles, Calif.
TUTHILL SPRING COMPANY
762 W. POLK ST. CHICAGO 3 ILL.

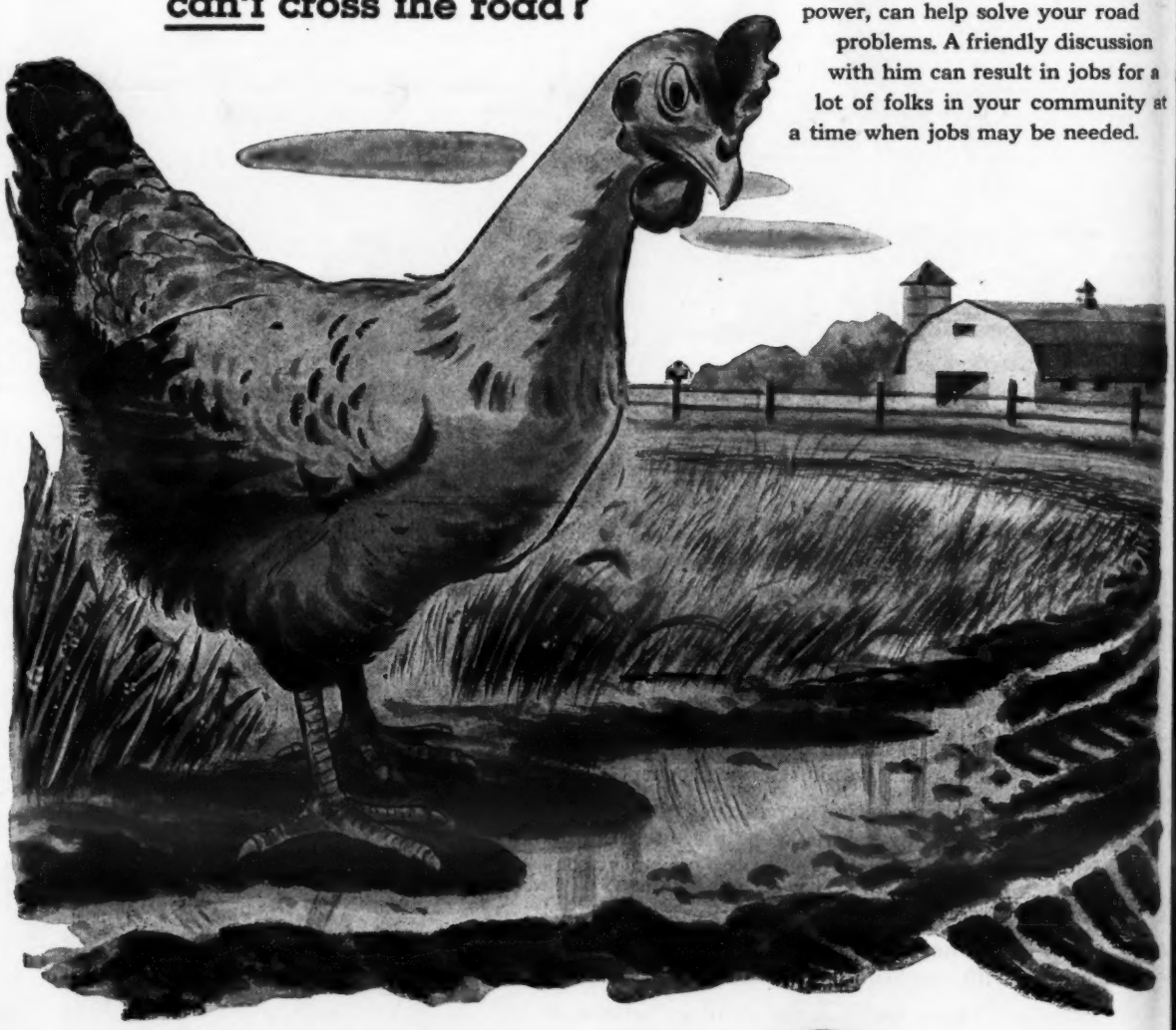
Any discussion of chickens and roads today raises a profoundly serious issue.

For chickens—and all other farm products—go to the nation's dinner table over a network of farm-to-market roads *which are rapidly breaking down.* More than 50 per cent of them have no surfacing whatsoever. Rough, pitted and dangerous, they cost the farmer money, cause delays, and disrupt the nation's food distribution system.

And the problem will become even more acute as traffic increases after the war . . . unless communities begin to plan at once for road repairs and construction.

That is why we suggest you call in the Tarvia field man now. He can offer you the benefit of 40 years of successful experience in road construction, maintenance and repair. He can show you how Barrett Tarvia, with local materials and local manpower, can help solve your road problems. A friendly discussion with him can result in jobs for a lot of folks in your community at a time when jobs may be needed.

Suppose, some day, the chicken can't cross the road?



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Barrett Tarvia*

A Plan to Modernize Boston's Street Maze

(*Continued from preceding page*)

pated volume of post-war traffic and the frequency of street intersections will continue to prevent a reasonable traffic flow and conditions will become steadily worse unless proper plans are made to relieve them.

The proposed Central Artery will traverse widened existing streets part of the way and proceed over new layouts at other locations. Ordinary street widenings or new streets at grade will not accomplish the desired result for such an artery. It must contain an expressway with no cross movements, no left turns, no pedestrians, and no access except at designated points. The only design which will satisfy these conditions is one in which the grades are separated at all cross streets that cannot be cut off. In downtown Boston, streets that cannot be cut off are so close together that the grade separations would be continuous and the result would be an elevated or depressed highway.

A depressed highway in open cut with service roads on either side and with cross streets carried across on bridges at ground level would be an attractive solution if sufficient width could be obtained. In general, however, such a solution is not feasible in downtown Boston for the entire length of the project because of the high property damages. A depressed highway in a roofed tunnel with local traffic on the roof would overcome the width problem but would add greatly to the initial cost and the maintenance because of the necessary ventilation, lighting, etc.

Either design is further complicated by the cost of constructing and maintaining a structure below tide-water level and by the existing underground structures that would be encountered, such as subways and water, sewer, gas, and wire pipes and conduits.

The solution, therefore, consists of either an elevated structure, a depressed highway, an expressway at grade, or a suitable combination of these three designs.

It has been suggested that the proposed structure be considered a through-route highway entirely, with only one or two ramp approaches to it along its entire length. The through-route traffic in this area is not sufficiently heavy to warrant such a highway. If the primary purpose of the project were rapidly to move a heavy through-traffic from one side of the city to the other without mixing with local traffic, there would be no need of constructing it through the heart of the city, as a more expeditious and less expensive route could be obtained elsewhere.

The primary purpose of this project is to relieve downtown-Boston congestion where the problem is largely local traffic and traffic desiring to enter and leave the area. This can be done only by providing such highway facilities as will give quick and easy access to the area and will accommodate a sufficient number of cars so that the congested conditions on the adjacent streets will be materially relieved.

The principal points which will need access to and from the expressway are the South Station, State Street, Sumner Tunnel, Haymarket Square, the North Station, and Prison Point Bridge.

The new artery should consist of an 8-lane divided surface roadway with a 6-lane divided expressway. Approximately 60,000 cars per day have been estimated as the amount of traffic which will use the expressway. Although eight lanes are suggested for the surface highway, it is not anticipated that these will carry more than 50 per cent of the amount carried by the expressway because of the interruptions caused by the entering streets and businesses along the way. It is estimated that a total of 90,000 cars per day will use the artery upon completion.

Northerly Approach

The Northern Artery, the logical northerly approach to the Central Artery, in 1941 was carrying 34,000 cars per day on one section, and at the Revere Beach Parkway it was carrying from 40,000 to 50,000 cars daily over a distance of approximately 3 miles. Inasmuch as there are eight locations within the 3-mile length of highway which warrant special interchanges, the Committee recommends that the whole route be considered and that some form of express or controlled-access highway be provided as the northerly approach. It is suggested that either an elevated highway be continued as a 6-lane divided roadway, or that a 6-lane depressed highway be constructed with suitable service roads, or that a 6-lane divided roadway on the existing grade be fenced, with limited access to it and service roads provided, and with proper interchanges at the intersections.

Southerly Approach

The southerly approach to the Cen-

(*Concluded on next page*)

SPEED OPERATION for Snow Plows and Road Machinery with the . . . .

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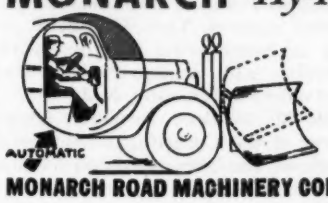

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A Plan to Modernize Boston's Street Maze

(*Continued from preceding page*)

tral Artery extending generally in the direction of Blue Hill will serve heavy volumes of traffic which now enter and leave the city via several routes. It has been estimated that approximately 42,000 cars per day, to and from the south, will use the Central Artery. This traffic will follow the proposed Blue Hills Radial to the end of the route.

It is recommended, therefore, that this route consist of a 6-lane divided limited-access highway with the grades at the principal intersections separated and all other intersections cut off. Pedestrians should be prohibited from crossing on the surface and overpasses should be provided for them at convenient places.

The Committee emphasizes that the only proper and complete solution to the problem is a continuous express route through the city from a point of dispersal on one side to a point of dispersal on the other as provided by the suggestions outlined, beyond which points additional improvements on state highways, metropolitan parkways, city and town streets may be necessary but which may be of less magnitude than the central improvements.

Easterly Approach

The easterly approach to the Central Artery is by way of the Sumner Tunnel, which approach also is the connection between Boston proper and the new Municipal Airport, Logan Airport, at East Boston.

Studies in 1941 showed an average daily traffic of 19,000 cars over this approach. Projecting the figures twenty years hence, the Committee feels that there will be an assured 50 per cent increase.

On the basis of 1,000 to 1,250 vehicles per lane on the easterly approach, the Committee proposes the following:

1. Route C-1 and Sumner Tunnel to McClellan Highway, a 6-lane divided roadway with necessary service roads and with no intersections at grade.
2. Logan Airport Highway, a 4-lane divided highway with lanes of sufficient width to allow passenger cars to overtake and pass slower-moving heavy trucks and buses with safety.
3. Junction of Route C-1 and the highway to the airport. In order to accommodate the many anticipated turning movements to and from the airport, provisions for interchange of traffic without cross movements should be made at this point.

The Logan Airport is being gradually established as the focal point of aviation for the northeast section. This being so, the field must be properly serviced. On this score alone the proposed project is warranted. If further support for the project is required, however, the Committee points to the traffic conditions that exist on the short stretch of Route C-1 between the northerly portal of Sumner Tunnel and the McClellan Highway. Of course the traffic volumes projected in this report cannot become a reality until the second tube of the Sumner Tunnel, as originally intended, is constructed to relieve conditions which are presently reaching capacity.

The design and operation of the Central Artery and its approaches as limited-access ways will afford a swift unimpeded flow of traffic and will provide capacity not otherwise attainable. The efficiency and capacity of the route will be impaired, however, unless the outlying connections are adequate.

Recommendations

The Engineers Committee on the Boston Arterial Highway recommends that the studies be continued in order that (1) a complete plan for the important routes entering and passing through Boston may be prepared; (2) that the definite location and design of each project may be determined at the earliest possible date; and (3) that surveys, plans, estimates, and specifications for each of the projects so determined may be prepared as quickly as possible to take advantage without delay of any appropriations that may be made in the post-war period.

Worthington Pump & Machy. Names Engg. Vice President

Harry A. Feldbush, formerly Works Manager of the Holyoke, Mass., plant of Worthington Pump & Machinery Corp., has been named Vice President in Charge of Engineering for the entire corporation, with headquarters at the general offices in Harrison, N. J.

Ralph M. Watson, formerly Chief Engineer of the Centrifugal Engineering Division, has been appointed Assistant to Mr. Feldbush.

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Highway Shop Serves One-Half of Large State

Eight-Building Plant Has Equipment to Turn Out 25 Repair Jobs a Month Even With Staff Halved by War

THE State Highway Department of Georgia has a maintenance plant located at Douglas in the south-central part of the state which furnishes the maintenance forces of the southern half of Georgia with parts and supplies, and where equipment used in that territory is repaired and kept in shape. The eight buildings comprising this plant, known as Shop No. 2 to distinguish it from the main East Point Highway Shop in Atlanta (See C. & E. M. Jan., 1944, p. 37), are a warehouse, machine shop, blacksmith shop, maintenance shed, sign paint shop, equipment paint shop, storage building, and wash shed.

Before the war the average number of workers at the Douglas shop totaled from 25 to 30, but at present only 14 are employed and this shortage is felt severely. The regular electrician, for instance, is now in the Army, the blacksmith left for a war job, and their positions were unfilled. With the present shorthanded crew, the shop still managed to turn out an average of twenty-five equipment-repair jobs a month, from grinding the valves on a light truck to rebuilding a tractor engine.

The Douglas shop occupies 6 acres of land in the northwest part of town, a short distance from the intersection of Ga. 31 with Ga. 32 and adjoining a spur track of the Georgia & Florida Railroad. A low wire-strand fence encloses the property which has three of its eight buildings fronting on Walker Street. At the left on entering the yard from this street is a 150-foot-wide x 50-foot-deep warehouse of wood-truss construction with corrugated-metal sides and roof and a concrete floor. From its central location in the southern part of the state, this warehouse supplies the various maintenance crews with such sundry equipment as nails, axes, shovels, assorted hand tools, road signs, blades, etc., from a stock which has an inventory value of $65,000. At the right rear, or northeast, corner of the warehouse is the office of the shop superintendent.

The other two buildings along the south or front end of the property, in line with the warehouse, are a 50 x 60-foot maintenance shed which is used for truck storage, and a 50 x 40-foot sign-painting shop where road-designation and directional marker signs are painted either with stencil and brush or by the silk-screen process. Like the warehouse, these buildings are also of corrugated-metal construction.

Machine Shop

To the north at the rear of the warehouse is a 50-foot-wide x 200-foot-deep machine shop constructed of materials similar to the other buildings. This shop has five sliding doors, 12 feet wide x 16 feet high, one in the center of the south wall and two each along the long sides. With these doors and with windows at frequent intervals along the sides, the shop receives good natural lighting and also has two rows of electric lights fastened to the trusses overhead. A couple of cast-iron stoves are put in the shop during the winter and removed in the spring. Protection against fire is provided by twelve Essanay hand extinguishers of the soda-acid type, located at frequent intervals throughout the shop.

Every operation necessary for the rebuilding of gasoline engines, with the exception of grinding crankshafts, is done in this shop with a well balanced complement of equipment. Crankshafts are sent to the main shop at Atlanta for grinding. Tractors, graders, and trucks are dismantled and rebuilt, with the heavy parts resting on sturdy wooden tables of various sizes placed along the center of the shop. Along the side walls are wooden work benches equipped with bench vises and outlets for compressed air. Also available are two Weaver 7-ton floor jacks for lifting equipment.

In the southwest corner of the shop is a G-E Tungar battery charger while further north along the west wall of the

(*Continued on next page*)

C. & E. M. Photo

The Douglas shop takes care of all State Highway Department equipment in the southern half of Georgia. The warehouse, shown here, is one of eight buildings in the group comprising the plant.

TRANSITS and LEVELS
HEADQUARTERS for REPAIRS—any make

We will buy or trade in old Transits, Levels, Alidades, etc. Send instruments for valuation.

Write for new Catalog CE-19 of Engineering Instruments, Engineering Field Equipment and Drafting Room supplies.

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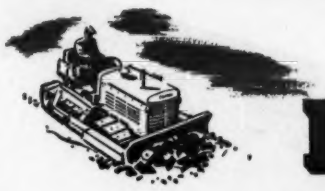
A Tocco induction heat-treating machine for hardening track shoe pins in the Oliver "Cletrac" plant.



It's our "treat"

On a crawler tractor, the track shoe pins are subjected to destructive abrasion shocks and strains. To resist these . . . to assure longer pin life, Oliver "Cletrac" tractors have hardened pins . . . electrically heat-treated to an exact depth by the most modern methods.

This *extra* quality is characteristic of every Oliver "Cletrac" tractor part . . . a basic feature of every manufacturing operation.

Quality is fundamental to every production step in the modern Oliver "Cletrac" plant . . . in materials, workmanship, and equipment.

Maintenance of that standard enables your Oliver "Cletrac" dealer to offer you the finest in crawler tractors . . . for your every need.

CLETRAC — OLIVER Cletrac

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The OLIVER Corporation

Highway Shop Serves One-Half of Large State

(*Continued from preceding page*)

building is a Raybestos brake-lining machine. About midway of the shop on the west side is a rack for storing assorted steel shapes such as tubing, angle irons, square and rectangular lengths, which are cut by a Peerless 24-inch power saw driven by a G-E 2-hp motor. Further along on this side is a Manley 40-ton hand-operated hydraulic press used in removing bushings and gears, and a Hobart 300-ampere electric arc welder. The shop also has the usual oxy-acetylene welding outfits and a P&H 225-ampere electric welder driven by a Continental gasoline engine, with the entire unit mounted on a rubber-tired trailer so that it can be towed by a truck for repairs in the field.

Track Press

Across the rear or north end of the shop is a track press which is used to dismantle and reassemble the treads on crawler tractors. This has proved to be a most valuable piece of equipment in the sandy country of southern Georgia where tractor-tread pins and bushings receive considerable wear, and must be replaced at frequent intervals after they have been removed and turned once. The crawler shoes themselves usually outlast two sets of pins and bushings which bear the brunt of the grinding action of the sand. This machine doubles the life of a set of tracks on a crawler tractor by removing pins which are worn down on one side, and replacing them with the comparatively unworn side adjacent to the treads.

The Harris 100-ton press driven by a Sterling 15-hp motor is located at the center of 46 feet of track made up of rollers 15 inches long x 2 inches in diameter set in bearings on 6-inch centers. The crawler treads are lifted to this rolling stand by two traveling derricks, each mounted on four iron wheels so that they can be easily pushed around the shop, and from the top arm of which is hung a Superior 1-ton hoist. The treads are pushed along the rollers to the press which forces out the pins which are then turned and pushed back into place.

Other Equipment

Along the east side of the machine shop is located such standard equipment as a 24-inch lathe with 14-foot bed driven by a Sterling 2-hp motor; a Cincinnati No. 2 milling machine driven by a G-E 2-hp motor; a South Bend 14-inch lathe with 4-foot bed driven by a G-E 2-hp motor; an Excelsior 21-inch drill press driven by a G-E 3-hp motor; a Sunnen wrist-pin hone driven by a G-E ¼-hp motor; a high-duty grinder with twin 2 x 12-inch stones; a Simplicity piston grinder driven by two Leland motors, a ¾ and ⅓-hp, one to turn the piston and the other to turn the stone; and a Black & Decker 10-inch bench grinder.

Here also are located several pieces of equipment used in the rebuilding of gas engines, including a Van Norman 905 boring bar for cylinders; an Ammco line reamer boring bar for crankshafts; a Heald No. 60 cylinder grinder driven by a G-E 4-hp motor; a Riteway aligner used in rebabbitting connecting rods; and a Van Norman valve refacer driven by a G-E ¼-hp motor. Brake drums are turned on a special boring lathe. Two long wooden bins are placed on the floor near where the engines are worked on for the collection of old parts, which are salvaged if at all possible.

In the southeast corner of the shop are the shower room and lavatory, alongside of which is a wire-enclosed tool room. Next to this is the ignition room equipped with a Weidenhoff test bench; an Eisemann coil tester; a King motor tester; and an Edison magnet charger for testing armatures.

Blacksmith Shop

To the rear and west of the machine shop is a 40 x 30-foot blacksmith shop, also of corrugated-metal construction, in which is kept an Ingersoll-Rand compressor to furnish compressed air for the entire plant. This double-action machine with a 7-inch bore and a 6-inch stroke is driven by a Westinghouse 15-hp motor and stores air at 120-pound pressure in a tank 7 feet high and 3 feet in diameter. The regular equipment of the shop includes a forge, 5 feet square, with a Buffalo Forge electric blower driven by a G-E ¼-hp motor, and a 200-pound anvil.

Just south of the blacksmith shop are two asphalt storage tanks, each with a capacity of 14,000 gallons, which are heated by a portable, horizontal, loco-

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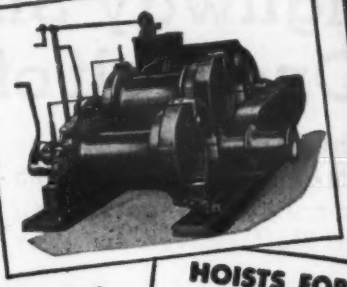
Hoists to Fit the Job



Lidgerwood hoists have earned a 70-year reputation for dependability and efficiency *on the job*. There's a Lidgerwood gasoline, steam, electric or Diesel hoist to fit every construction need. When you need a hoist inquire *first* of LIDGERWOOD.

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"INFERNO"... for Long, Safe STEAM HOSE SERVICE

"INFERNO" is built to GOODALL'S "Standard of Quality" specifications, which means it is carefully made from the best available materials, including high-tensile asbestos, mandrel cured. Tube provides exceptional resistance to excessive temperatures. Extra safety is assured by special construction which retards escape of steam if hose is punctured. Will withstand extreme flexing.
The qualities that make "Inferno" so reliable under severest working conditions assure even greater economy when used for milder types of service.

For working pressures up to 200 lbs. and super-heat steam temperatures up to 400° F. Sizes: ½" to 2½", inclusive; max. lengths of 50 feet.

OTHER GOODALL HOSE for contractors includes water, air, suction, discharge, cement material, concrete placing, hydraulic, grout, jet, jenny and bulldozer. Contact our nearest branch or main office for details and prices on these and other products by GOODALL . . . on the Job LONGER!

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WE ARE PARTICIPANTS IN THE OWNERSHIP AND OPERATION OF NATIONAL SYNTHETIC RUBBER CORPORATION
Factory—Trenton, N. J. (Est. 1870) 75 Years of "Know How"—Our Most Valuable Commodity.

Highway Shop

(Continued from preceding page)

motive-type, coal-burning boiler. The bituminous material is pumped from these tanks into distributors by a 3-inch asphalt pump driven by a Ford gas engine.

Other Buildings

The remaining three buildings located east of the machine shop are a 30 x 30-foot wood-frame wash shed, open at the sides, where equipment is washed with steam from a Kerrick Kleaner; a 30 x 30-foot wooden building used for miscellaneous storage; and a 40 x 50-foot paint shop of corrugated-metal construction where highway equipment is painted with DeVilbiss spray guns. An exhaust fan in the east wall of the shop sucks excess paint spray into the open.

In the yard adjacent to the east side of the machine shop is a stationary frame on which is hung a Hercules 5-ton hoist for unloading machines which have been hauled to the shop on a trailer pulled by an International DR-50 transfer truck. This trailer combination is also used to return the equipment, after it is repaired, to the district to which it belongs. Also used in unloading heavy equipment is a Mack truck which has been outfitted with a CMC 5-ton hoist on the end of a 12-foot boom.

Personnel

The Douglas shop does between $6,000 to $7,000 worth of maintenance repair work in a month; this figure includes the cost of labor and parts. W. S. Mooneyham is Superintendent of the Douglas shop and W. Newbern handles the office records. G. T. McDonald is State Highway Engineer of Georgia while C. F. Bond is Maintenance Engineer.

Improved 10-Inch Pump Described in Bulletin

The Model 200M CMC improved 10-inch pump, made by the Construction Machinery Co., Waterloo, Iowa, is described in a new bulletin. Designed for large construction jobs, irrigation, well-point and predrainage work, and dam construction, the Model 200M is available with one of three makes of gasoline engines, with an International Model UD9 53-hp diesel engine, or a 20-hp 1,150-rpm electric motor. Mounting is on standard or extra-heavy skids, four 24 x 5-inch roller-bearing wheels, or four 5.50 x 16 pneumatic tires on Timken-bearing wheels for high-speed towing.

Features of this pump include mixed-flow propeller, replaceable wear ring, extra-large pump shaft on two heavy-duty ball bearings, triple shaft seal, built-in large-area suction check valve, correctly designed volute, and low pump speeds. Capacities range from 4,050 gpm at a 20-foot head to 440 gpm at a 120-foot head.

Copies of this new bulletin on the CMC Model 200M are available direct from the manufacturer by referring to this review.

The Money You
DON'T SPEND
Helps Hold
Living Costs
D
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n!

Official U. S. Navy Photo

A Seabee uses a Caterpillar D6 equipped with a Hyster winch to pull a 10-wheel truck out of the mud on New Britain Island in the Solomons.

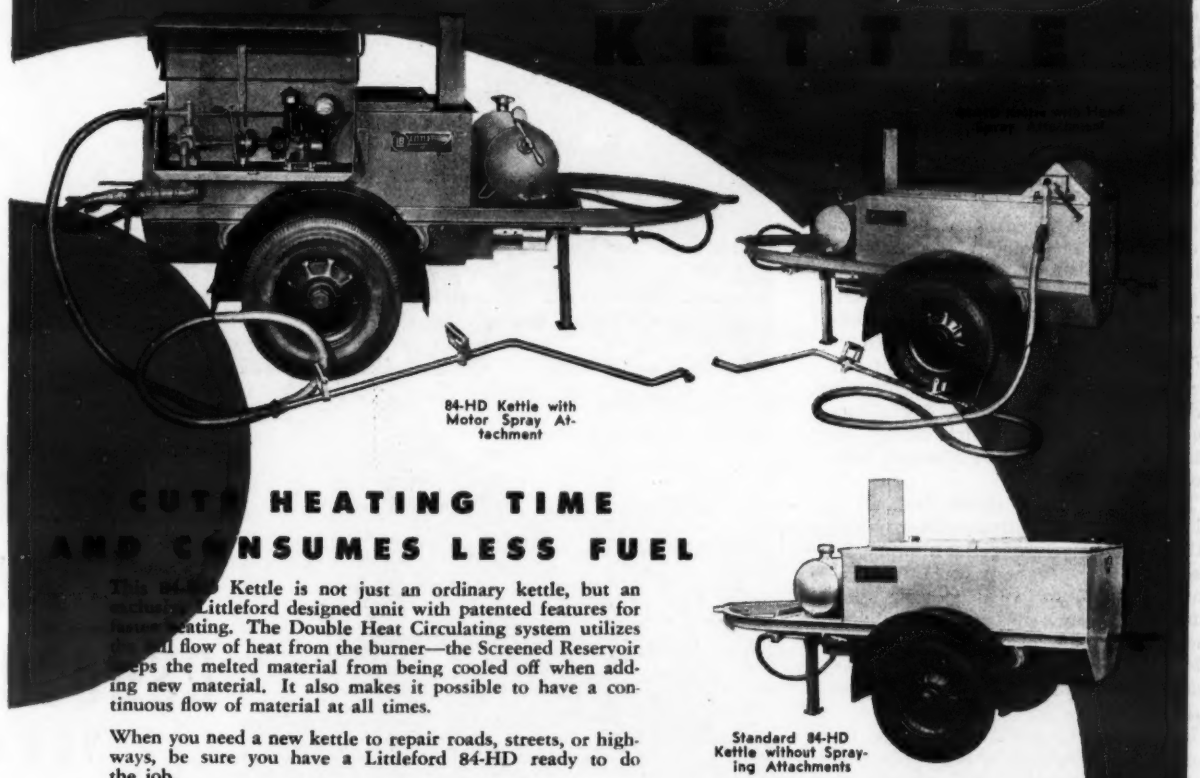
Handy Dynamometer Tells Weight of Load

There are two types of dynamometers, the absorption type and the transmission or traction type. In the former, the work is converted into heat, while in the latter the magnitude of the force passed through the instrument causes a deformation in a spring which is indirectly proportional to the load and which is measured by mechanical means. The Dillon dynamometer, made by W. D. Dillon & Co., Inc., 5410 W. Harrison St., Chicago 44, Ill., is of the traction type and is used to check the weight of all kinds of loads. It may be used on your crane to be sure that the load you are picking up is not beyond the capacity of the crane; it may be used to weigh loads of steel which are being picked up by crane; and it is used to check hydraulic pistons and the pull on cables used as guy ropes or high lines.

The Dillon dynamometer is made in nine different capacities, but they are all the same size and the same weight. The weight of the instrument less the shackles is only 5 pounds 10 ounces and it measures 8¼ x 6¼ x 3 inches. The smallest unit is the 0-500-pound model which has 5-pound divisions, while the largest has a capacity up to 10,000 pounds, with 100-pound divisions.

The various services of these dynamometers as well as a complete description of them will be found in a new 20-page booklet which may be secured direct from the manufacturer by mentioning this item.

THE Littleford 84-HD KETTLE



84-HD Kettle with Motor Spray Attachment

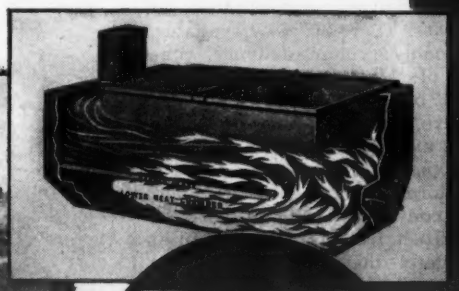
CUTS HEATING TIME
AND CONSUMES LESS FUEL

This 84-HD Kettle is not just an ordinary kettle, but an exclusive Littleford designed unit with patented features for fuel saving heating. The Double Heat Circulating system utilizes the waste heat flow of heat from the burner—the Screened Reservoir keeps the melted material from being cooled off when adding new material. It also makes it possible to have a continuous flow of material at all times.

When you need a new kettle to repair roads, streets, or highways, be sure you have a Littleford 84-HD ready to do the job.

With a Hand Spray Attachment, the 84-HD cuts cost of maintenance work. Streets and highways can be put into shape faster.

Standard 84-HD Kettle without Spraying Attachments



Top—Double Heat Circulating System
Bottom—Screened Reservoir

LITTLEFORD

LITTLEFORD BROS., INC. 485 E. Pearl Street Cincinnati 2, Ohio

"I finally managed to get that new blade but now I need a new tractor!"

New All-Wheel-Drive Trucks for Civilians

With the announcement of new heavy-duty all-wheel-drive trucks for civilian use, post-war planning becomes definite action at the plant of the Marmon-Herrington Co., Inc., Indianapolis 7, Ind. Production is scheduled to start soon, and is to be concentrated on two models, the MH555-4 and the MH440-4.

The larger of these two, Model MH555-4, will be powered by a 131-hp engine, will have a wheelbase of 161 inches, and a permissible gross loaded weight of 27,000 pounds, carried on 11.00 x 20 tires. Slightly smaller, the Model MH440-4 will have a 118-hp engine, a 158-inch wheelbase, a permissible gross loaded weight of 22,500 pounds, and will be equipped with 10.00 x 20 tires. Both models will have ten forward speeds and four reverse.

Retaining the many features which Marmon-Herrington pioneered in the multiple-wheel-drive field, such as low center of gravity, greater angle approach, constant-velocity steering end joints, and others, these new all-wheel-drive units will also embody numerous design features arising from the company's experience in producing heavy-duty military vehicles. These improvements include new double-reduction axles, powerful air brakes, and a new steering-gear design which makes for easier and more positive steering control.

The manufacturer states that, all in all, these new Marmon-Herringtons will be even more rugged and powerful than their predecessors, and are specially suitable for such jobs as snow removal, heavy-duty earth-moving and construction projects, and similar off-the-road operations where power, traction, and stamina are "must" requirements.

In addition to these new trucks, the company is also getting back into production, for commercial purposes, on its all-wheel-drive conversions for Ford trucks. There are now available, for reasonably prompt delivery, conversions of 1½-ton standard Ford trucks to both four-wheel and six-wheel drive, and of ½-ton Ford pick-up trucks and station wagons to four-wheel drive.

Full information on either the new trucks or conversions for Fords may be secured direct from the manufacturer who suggests that, since production will necessarily be limited at first, inquiries be made promptly.

Area Sales Managers Named by Barber-Greene

The Barber-Greene Co., Aurora, Ill., manufacturer of materials-handling equipment and bituminous mixing and paving machines, has expanded its area sales organization by the appointment of new sales managers for the New York and Canadian areas.

Capt. Earle F. Lamprey, until recently stationed at Camp Claiborne, La., has been placed in charge of the New York area. Prior to serving in the armed forces, Mr. Lamprey was for a number of years in the Barber-Greene Boston sales office. Ralph Dano, recently released by the WPB where he served as Deputy Director, Construction Machinery Division, has returned to Barber-Greene and will head its sales activities in Canada. He will make his headquarters in Toronto.

Other Barber-Greene Area Sales Managers are L. A. Larson, Minneapolis, Minn.; B. E. Lindstrom, Aurora, Ill.; E. L. Benson, San Francisco, Calif.; E. H. Cooper, Dallas, Texas; and Tom Benbow, Atlanta, Ga.

"E" Award to Jack Mfr.

Templeton, Kenly & Co., Chicago, Ill., was recently awarded the Army-Navy "E" Award. This company's most prominent contribution to the war effort has been a special track connector for the speedy mounting, demounting, and repair of tank crawler treads. In addition, large numbers of its regular line of hydraulic, screw, and lever jacks have been used in various phases of the war effort.

LITTLE RED DEVIL

Light and Power for the Contractor

Superior Features
1. Constant Voltage
2. Tropical Insulation
3. Splash Proof
4. Flyball Governor
5. Oversized Fuel Tank
6. Foolproof Coupling
7. Oversized Engine
8. Moderate Cost

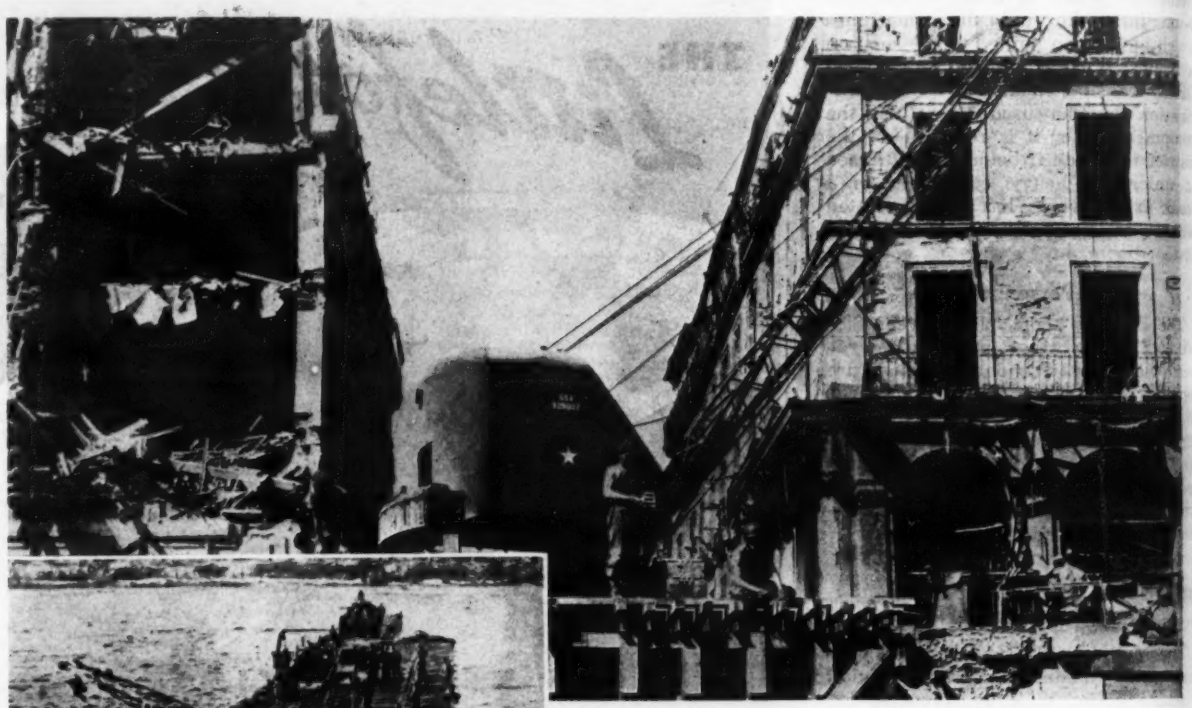
Model DC 600, on steel wheels $728.00

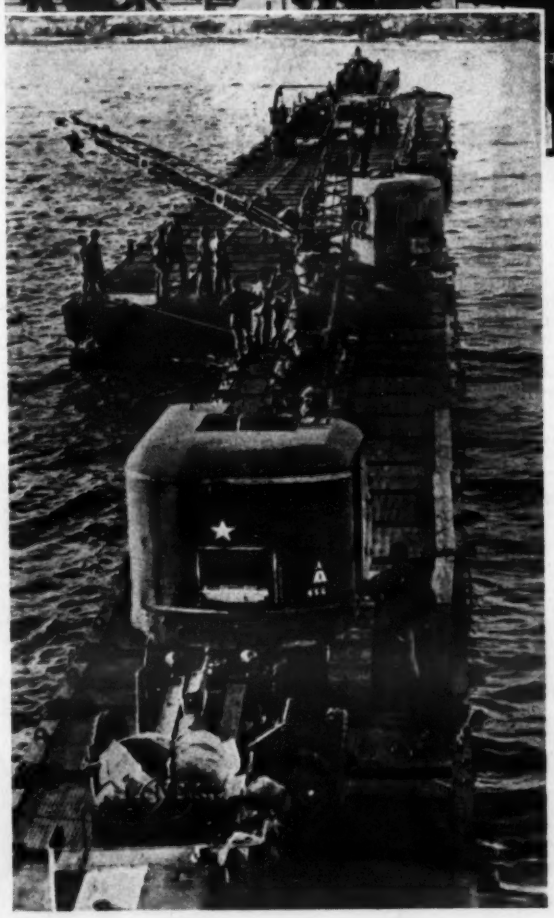
Diesel and gasoline engine driven light and power plants 2 to 50 K.W. Floodlights and portable poles.

Rentals — Sales

IMMEDIATE SHIPMENT

[illegible] 43-37 VERNON BOULEVARD LONG ISLAND CITY 11, N.Y.





Here's THAT

OSGOOD MODEL 200

YOU'VE WANTED!

Here are just three of the more than 1400 Osgood Model 200's produced for the U. S. Engineers alone. One is erecting a temporary bridge to help rebuild a war-ravaged city in Europe. Two others are moving into a Pacific island to help build one of the air fields from which planes will put the "finishing touches" on Japan.

From battlefronts all over the globe, the story is the same . . . Osgood equipment, powerful and dependable, really pitched into difficult wartime assignments. We can't fill the civilian demand for Osgood equipment *yet*. But when restrictions are lifted, you'll find that the experience gained by Osgood engineers in producing this equipment for war will result in even better equipment for you . . . more powerful and dependable and more economical to operate. Plan now to profit on those postwar projects by using Osgoods. You'll find the complete line well worth asking about now!

THE GENERAL EXCAVATOR COMPANY
CRANES, DRAGLINES AND SHOVELS
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Associated with The General Excavator Company

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THE OSGOOD COMPANY • MARION, OHIO

ARMY E NAVY

OSGOOD
SHOVELS, DRAGLINES
CRANES

Seabees Construct Airfield on Iwo Jima

(*Continued from page 2*)

It turned out to be the most abrasive rock any of the men or officers had ever run through a pugmill. Geologists classify it as andesitic lava, with some tufa present. It weighs 101 pounds per cubic foot dry, crushed. Some of it is magnetic. All of it was so abrasive it wore out pugmill liner plates and paddles in 72 hours. The rock has a hardness factor of five. The only remedy the Seabees found was to re-line the pugmill and build up the paddles by hard-facing with Stellite rod every 72 hours. It is a 4-hour job; one that has to be done at night while no hot-mix is being batched.

Hot-mixing operations started at 5:30 a.m. and ended at 7:30 p.m. each day seven days a week. Three crews working 8 hours each dumped asphalt barrels continuously. Aggregate hauling was also a steady 24-hour operation.

Army specifications issued from the office of the island engineer govern the preparation of the asphaltic concrete. Specifications provide that asphalt-heating tanks must have ample capacity for at least a 12-hour run of the mixing plant. Work-tank asphalt temperatures must be within a 250 to 350-degree F range. Aggregate temperature is controlled between 250 to 375 degrees F, and any rock in the pugmill hopper which does not meet these specifications must be drawn off and put back in the stockpile.

Specifications also stress steady plant operation without stops or waiting for trucks, holding constant bitumen and aggregate temperature throughout the day. Uniform gradation of aggregate has been insured by as thorough and intelligent a system of laboratory control as construction in this part of the world has seen to date. It will be described in detail a little later. The Seabees started operating steadily, and the only subsequent change has been the upping of tonnage per hour to a maximum of 131.

Aggregate Routing

Four-ton dump trucks from the crusher haul stone to the plant stockpile, and another fleet of trucks haul fine screenings from a beach plant at the other end of the island. The two sizes of aggregate are dumped in the same stockpile, which is divided by a timber bulkhead.

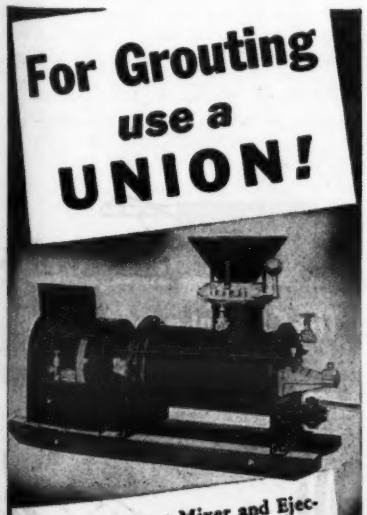
A battery of air compressors is used in lieu of steam to atomize fuel for the driers at the asphalt plant on Iwo Jima.

An Allis-Chalmers HD-10 tractor with a Baker bulldozer works the ¾-inch aggregate pile, keeping the feeder tube leading to the cold elevator filled. An HD-7 Allis-Chalmers with a Buckeye cable-controlled blade services the "sand" pile. It was found necessary to use a laborer at this latter chute to keep it clear. Since very little trucked material could be dumped directly in the chutes, the bulldozers have had to move about 120 tons an hour or more.

A Barber-Greene cold elevator moves the aggregate up to the driers. The rock is heated to an average temperature of 285 degrees F here, and dumped into the hot elevator which takes it up to the pugmill hopper.

The pugmill operator, by a manually controlled steel feeder belt, takes the hot aggregate out of this hopper and feeds it into the pugmill. About 5 per

(*Continued on next page*)



The Union Grout Mixer and Ejector does a thorough job, whether for roadbed stabilization or any other type of grouting requirements. *Send for bulletin* No. 195.

UNION IRON WORKS, INC.
Established 1900
ELIZABETH 8 NEW JERSEY
Export Office — 50 Church St., New York 7, N. Y.

They're necessitated by the fact that we're currently faced with the problem of fulfilling our "roller obligations" to the armed services and getting production under way on the limited number of Maintainers and Rollers we've received permission to manufacture for civilian use. As a consequence, we haven't found time to get out into the field and photograph our 1945 models at work. Users report, however, that these new Hubers are even better performers than their predecessors. And that's saying something!

THE HUBER MFG. COMPANY • MARION, OHIO, U. S. A.

HUBER ROLLERS

A Barber-Greene finisher spreads hot-mix surfacing on one of the runways at the airfield on Iwo Jima.

Iwo Jima Airfield

(*Continued from preceding page*)

cent of AP-3 asphaltic cement, of 60 to 70 penetration, is mixed with the rock and it is dumped in the waiting Diamond T trucks.

The amount of fines fed into this mix is controlled by constant laboratory tests. In order to be acceptable, a typical cross-sectional sample of aggregate at the pugmill must meet these specifications:

Screen Size	Design Limits (Per Cent Passing)
1-inch	95-100
¾-inch	85-95
½-inch	70-85
No. 4	35-65
No. 40	15-30
No. 60	8-20
No. 100	6-18
No. 200	5-15

Routing of Asphalt

Liquid asphaltic cement has to be shipped to Iwo Jima in 52-gallon drums, unloaded by lighters or "ducks", and trucked to the plant. The bulldozers scraped clean a 10-acre area adjacent to the receiving tank, and thousands of drums of asphalt are stored there.

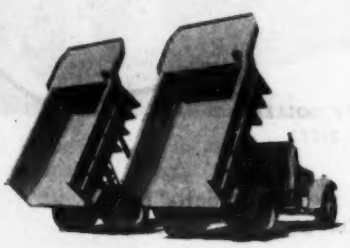
It is then hauled when needed to the receiving tank, where a gang of Seabees cut the top away from each drum with an air-powered chisel. The drums are picked up one at a time by a Seabee-manufactured hand winch, and a drum torch fired with diesel fuel and air (chalk up another use for the compressors) melts the bitumen. It drops into a concrete receiving tank 21 x 14 x 7 feet high with a capacity of 10,000 gallons. This receiving tank is divided into two compartments. Each compartment contains five tiers of 2-inch steam coils, placed ten wide. Each pipe is 20 feet long. When dumped asphalt melts in one side of this receiving tank, it overflows a baffle plate and the second tier of steam coils heats the bitumen.

Steam at 120 pounds per square inch is maintained in the coils. This often heats the bitumen sufficiently so that it can be used by the pugmill operator directly from the big tank, especially during the morning. By afternoon the cooler bitumen from the dump compartment has lowered the temperature, and it has to be heated some more in the ready tanks.

(*Continued on next page*)

Twenty Tons...

PLENTY TOUGH!



MARION BODIES

"HAUL IT AND HAVE IT"

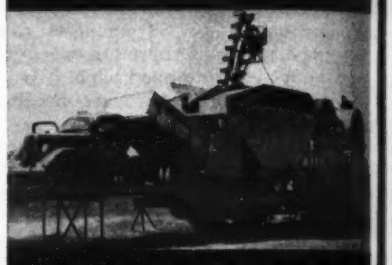
Yes, they can haul up to 20 tons of rock, for they have that specially-engineered construction that makes them ask for more where others would ask for mercy.

The bodies pictured are made with ¼" steel shell and 2" oak floor under a ⅜" wear plate. They have twin telescopic straddle mount hoists.

Marion offers a full line of dump bodies and hoists. If you require truck bodies of special design, MARION engineers will do your job effectively and economically.

See Your Local Distributor or Write
THE
MARION METAL PRODUCTS CO.
BODY and HOIST DIVISION, MARION, O.

JOHNSON
Porto-Batcher
SAVES A LOT of TIME and MONEY



Quickly Set Up for Operation at the Most Advantageous Location

The Johnson Porto-Batcher is a complete highway portable batching plant. Its use permits these substantial time and money savings:

1. The Johnson Porto-Batcher can be towed behind a truck to the most advantageous point in the pouring area. **2.** Since the Porto-Batcher is quickly set up for operation, long hauls of mixed concrete are eliminated . . . the number of mixing units is reduced and the number of concrete yard miles lessened. Control of all operations is centralized. **3.** All materials are delivered to the batching unit in bulk material trucks . . . eliminating extra handling equipment. **4.** The Johnson patented charging skip permits full utilization of mixer capacity. By providing proper intermingling of aggregates with cement when discharged into mixer, it assures pre-mixing and pre-shrinkage . . . prevents cement from touching wet mixer opening and walls thus eliminates gumming and excessive wear. **5.** All levers are grouped in one central location to permit control of operations by one man. Write for bulletin.

Write for data on Ready Mix Plant • Bulk Cement Handling Equipment • Cement Storage Bins • Concrete Buckets • Batchers

The C. S. Johnson Company
Champaign, Illinois

Iwo Jima Airfield

(*Continued from preceding page*)

At any rate, asphalt below its proper mixing temperature is pumped into the first of two 5,000-gallon-capacity work tanks, which are insulated with wood and dirt. If asphalt is being used from these tanks, it is moved by a metering pump from a reservoir to the five spray heads inside the pugmill.

Welding Replaced Gaskets

The Seabees ran into quite a distressing condition on the steel work tanks, a condition which could have lost them much valuable time very easily. When they insulated the steel work tanks, the added heat on the outside walls promptly caused all the rubber gaskets along the bottom and sides to fail. In a few hours the Seabees had liquid asphalt squirting everywhere.

Emptying the work tanks as quickly as possible, they tore the insulation away and tied all the steel plates together by electric arc welding. They worked day and night to get this done. The tanks will be difficult to move if they ever need them again, but they made them asphalt-tight.

Laboratory Control

On the north side of the plant, away from the smoke and dust, the Seabees built a small laboratory. It was erected primarily to control the aggregate gradation, but the Seabees elaborated upon their equipment to sample asphaltic-concrete density. They also run a routine log of aggregate and asphalt temperatures. When the job was visited for CONTRACTORS AND ENGINEERS MONTHLY, they were correlating these data with screen analyses in an effort to determine the effect upon density and strength.

Although it was a bit too early to make definite predictions, the laboratory tests indicated that 290 degrees F was the best asphalt temperature with 310-degree rock, for proper pavement, rolling remaining the same.

One of the laboratory men even invented a power-driven set of screens. He hooked a Briggs & Stratton gas engine through reduction gears and eccentric-driven connecting rods to a small platform, upon which the screens were fastened. It saved manual labor and improved the accuracy of screen analyses.

Pavement

The hot-mix asphaltic concrete, after being dumped into a fleet of 4-ton Diamond T dump trucks, was sent up to the bomber field and spread by a Barber-Greene finisher. The subgrade was prepared by sheepsfoot rolling and blading to the proper elevation. It was more solid if built a few inches high and then bladed down to the blue-tops.

A uniform layer of crushed stone, graded from 1-inch to 2-inch and approximately 2 inches in thickness, was rolled to bed it into this sub-base. If it was necessary, water was added ahead of this operation by sprinkler trucks. If rolling developed any previously unnoticeable low places, these were brought to grade by the addition of extra stone, and rolling.

Approximately 0.35 gallon of asphalt emulsion was then applied per square yard. This tack coat was allowed to cure for at least 10 hours before the hot-mix was spread and rolled.

This power-driven set of screens, developed by one of the Seabee laboratory men, runs fast accurate laboratory tests of aggregate used for asphaltic-concrete paving on the runways at Iwo Jima.

The breakdown rolling was generally done by an 8-ton Buffalo-Springfield tandem roller very shortly after the mechanical spreaders laid a ribbon of

(*Concluded on next page*)

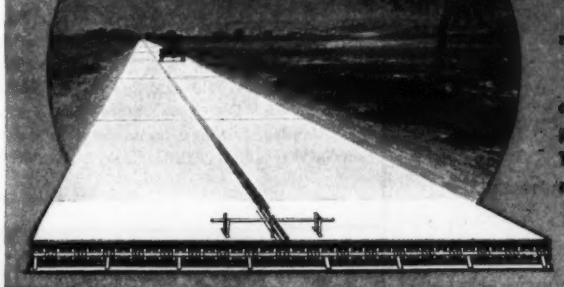
CUMMER
ASPHALT
PLANTS
EIGHT SIZES
Up to 1000 Tons per day
DRYERS
Two-Fire and Internal Fire
30 to 100 Tons per hour
Electric Batch Timers
50 Years' Experience
THE F. D. CUMMER & SON CO.
EAST 17th & EUCLID
CLEVELAND 15, OHIO

There's no Disagreement on . . . . . .
Road Joints!

In the 20s and 30s when concrete road building was getting its start, it was logical for highway engineers to resist the use of metal road joints. These joints were costly and new. Their use would cut down the total miles of hard road that could be built with the money at hand—and farmers were stuck in the mud!

The objective then was *miles today*. The cost tomorrow in maintenance was a secondary consideration.

In 1934 Federal engineers, realizing the necessity for crack control in concrete pavements, issued a bulletin requiring expansion and contraction joints on all new federal-aid highways. The large reduction in maintenance costs on federal-aid roads attests the wisdom of this action.

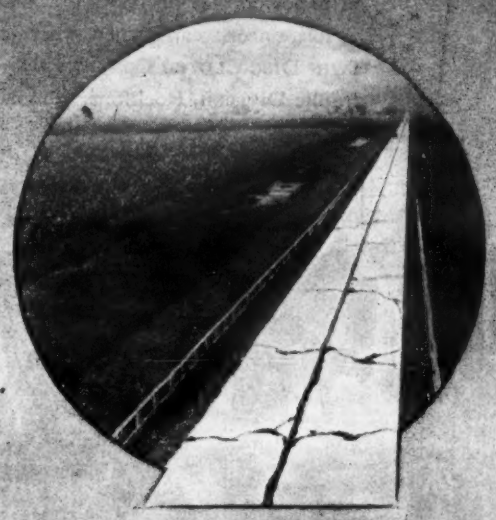


AFTER 10 YEARS—A ROAD WITH KEYLODE JOINTS LOOKS LIKE THIS

Today there's no disagreement on road joints. Everyone agrees that crack control in concrete pavements by the use of load transferring expansion and contraction joints is an economic necessity. The only unsettled problems involve the spacing, the design and the cost.

The mass of available data will make it easy for highway engineers to establish a joint spacing standard soon.

Many engineers have already decided that the KEYLODE contraction joint is the design they want—and the cost of KEYLODE joints is so little that you can get BOTH *miles today* and *crack control tomorrow* for the same money.



AFTER 10 YEARS—A ROAD WITHOUT JOINTS LOOKS LIKE THIS

HIGHWAY STEEL PRODUCTS CO.
Chicago Heights, Ill.

KEYLODE
CONTRACTION JOINT

Iwo Jima Airfield

(*Continued from preceding page*)

pavement. When the surfacing had cooled sufficiently to preclude checking, it was rolled by a 10-ton tandem until it would no longer "give". The pavement was cross-rolled whenever an area large enough had been developed.

A Huge Job—Well Done

In less than six weeks after the work started, the Seabees and a few Army Engineers had paved with 2-inch black-top an area at Iwo equal to the four main runways at La Guardia Field, New York. That will give you some idea of the magnitude of this work, which furnished small comfort to the Emperor of Japan and his misguided sons of Heaven. The work which the Seabees did at Iwo Jima saved American lives, American equipment, and pushed the war another vigorous step towards victory.

Those Seabees, with Lieut. W. H. Shears, CEC, USNR, (third from left) field officer in charge, run the asphalt plant on Iwo Jima.

The work at the asphalt plant comes under the general supervision of Colonel D. A. Morris, AAF, the island engineer; Commodore Robert C. Johnson, CEC, USNR, the Seabee Construction Brigade Officer in Charge, and Lieutenant Commander R. P. Murphy, CEC, USNR, the Battalion Commander. Lieutenant W. H. Shears is in charge of the asphalt plant in the field.

Be wise—hold your War Bonds.

Old Dominion State Plans Huge Program

A $93,000,000 road construction and improvement program is being planned by the Virginia Department of Highways on 540 miles of state roads for the first three years after the relaxation of wartime restrictions on materials. In addition, the Department estimates that about $11,000,000 annually will be expended during these three years for highway maintenance.

The major projects planned include work on 14.7 miles of the Henry G. Shirley Memorial Highway at a cost of $5,000,000; a $4,300,000 bridge over the York River at Yorktown; a $700,000 bridge over New River at Radford; and a $422,000 bridge across the James River at Westham near the Richmond city limits.

Other projects listed for improvement in the three-year program include a number of smaller bridges and various highway projects.

WHY TWIN DISC POWER TAKE-OFFS are standard on most power units . . .

One important reason is this: shafts, bearings, clutches and every other part of the mechanism is designed and built to provide a measure of wear-life well beyond ordinary requirements.

Second: The simplicity of design, which makes all points requiring lubrication readily accessible, helps to prevent neglect of this important service.

Third: The single, one-point adjustment, which requires no special tools, makes it a simple matter to keep the clutches in proper adjustment.

That's why, when you see the Twin Disc name plate on a power take-off, it's your assurance of "tops" in performance, wear-life, easy service and maintenance. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).

At left: Cross-section Twin Disc Power Take-off. Note that rugged construction is combined with simplicity in design.

Below: Twin Disc Power Take-off housings are furnished to suit the full range of SAE engine flywheel housings.

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Trowel a smooth, tough, plastic surfacing right over your old concrete or wood floor.

Plastic Rock comes complete, packed in barrels. Nothing more to buy. No application "formula" to confuse you. Simply mix and trowel right over old floor. Average depth one-half inch. Old floor Saturday is a new floor Monday. Also patches concrete to a perfect feather edge. Plastic Rock is absolutely spark-proof, skid-safe wet or dry, dustless, silent. Feels like cork under foot. Cannot splinter, crack, crumble, curl or loosen. Heavy loads on steel wheels actually improve it. Five-year-old floors show no wear. Natural color is dark gray. Used by U. S. Army, Navy and largest industries in America. Your contractor or your own crew can apply. Write now for complete information.

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Suspension Bridge Spans River in Peru

Recently Completed Project On Trans-Andean Highway Is Largest in Amazon Basin; Some Difficult Problems

+ OF the many and difficult problems involved in the construction of the Trans-Andean highway in northern Peru, one of the most interesting was the spanning of the Aguaytia River where difficulty of access and unusual soil conditions had to be overcome, and provisions made for periodic floods.

The main problem in the construction of this highway to the Ucayali River beyond Huanuco consisted of the determination of the route across the easternmost ranges of the Andes, the Cordillera Divisoria and the Cordillera Azul, between the drainage basins of the Huallaga and Ucayali Rivers in northern Peru. After establishing a route at 1,613 meters (a meter equals 3.281 feet) above sea level across the first range, the Divisoria, the problem of the second range, the Cordillera Azul, was solved in 1937 by the rediscovery of the Boqueron (or Pass) of Father Abad, through which the Yuracyacu River flows at an elevation of only 470 meters above sea level.

The Yuracyacu is a tributary of the Aguaytia River which flows from south to north beyond the Cordillera Azul, and the bridging of this river was studied simultaneously with the location of the highway between the mountains and the river port of Pucallpa on the Ucayali. Three years of intense reconnaissance work were required to complete a survey of the territory, virtually uninhabited and difficult of access. It was necessary to cut trails through this heavily forested region in order to compile a topographic map including the courses of all of the important rivers of the Aguaytia basin. More than 800 square kilometers (a square kilometer equals 247.1 acres) were thus surveyed annually, or a total of 2,500 square kilometers between 1938 and 1940. This survey demonstrated the necessity of crossing the Aguaytia River below the confluence with the Yuracyacu, along the course of which the highway entered the Ucayali basin, as affording the most feasible route for reaching the port of Pucallpa.

The Bridge Project

The Aguaytia bridge, the most important and largest thus far undertaken in the vast Amazon basin, is located in a valley 1,200 meters wide, where a narrows is formed by cliffs 50 meters high on the left bank. The cliffs are of stratified clay, compressed gravel and fine sand, at the foot of which the normal river bed is 155 meters wide. The right bank consists of low land which from time to time is inundated by river floods. Beyond this rise typical hills of red clay extending to Pucallpa, and which give their name to that river port. This low land, covered with vegetation, consists of mud and clay, with a subsoil of loose and compact gravel in its upper strata, below which are lenticular formations of compressed sand, strongly cemented gravel conglomerates, and hard sandstone.

The bed of the river has reached the upper strata of these compact formations. The river rises during exceptional floods to an elevation of 4 meters above the mean level, overflowing and inundating the marginal lands, and carrying with it the debris of the flooded forest lands, an agglomeration of tree trunks and branches which provide the spectacle known as the palizadas.

At such a location and under these conditions, the Aguaytia bridge, 704 meters in length, has been constructed, with a suspension span 170 meters in length, one end of which rests on the high cliffs of the left bank; two rigid steel spans, each 33 meters in length, and thirty-three 14-meter spans of simple steel beams serve as an approach to the main bridge and are located on land which is covered with water only during exceptional floods. The latter in these regions are violent and rapid, as the rainfall is heavy but of short duration. It is estimated that the rainfall in the vicinity of the Cordillera ranges from 3.80 to 4.20 meters per year.

This suspension bridge is located, as in the case of similar bridges on the highway, over a river whose bed is not definitely known and where statistics of rainfall are lacking, with a margin of height for exceptional floods, in addition to a further margin of not less than 6 meters to permit the passage of the palizadas. These considerations have led to placing the bridge level at a height of 8.50 meters above maximum observed flood heights. The approach sections descend from the river end of the suspension bridge with a grade of 1 per cent.

The foundation piers of the suspension bridge and the 33-meter spans adjacent to the river were carried to an average depth of 6 meters below the river bed and are embedded in the compact strata of the subsoil 12 meters below the surface soil. The foundation piers of the 14-meter spans were carried down to more than 4 meters below

(*Concluded on next page*)

IMMEDIATE DELIVERY

UNIVERSAL Level-Transit

Telescope 12" long, 25 power—Horizontal Circle 4½" with vernier to 5 minutes—Vertical Arc 3"—Clamp and Tangent Screw for Vertical and Horizontal Limb—Instrument weighs 11 pounds, tripod 9 pounds.

Price complete with Tripod, Carrying Case, Sunshade, and Dust Cap $115.00. Can be furnished with a compass at $12.50 extra—Stadia Wires $5.00 extra.

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Expert Repairing of All Makes of Instruments

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Stanolube HD has all three to resist all engine deposits

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3 OUTSTANDING ADDITIVES developed by our research chemists

NO STRAIGHT mineral oil, regardless of the refining method used, can equal the engine cleanliness and protection you get from Stanolube HD. No heavy duty oil available today has a better combination of these important oil qualities. (1) High oxidation stability (to resist varnish formation and ring sticking); (2) Good detergency (to keep deposit forming materials from sticking to engine parts); (3) Excellent corrosion resistance.

That's because no other oil is made from the same high grade crude, *plus* the same degree of refining, *plus the special additive* developed by Standard Oil. Engine tests prove that Stanolube HD is outstanding in the oil qualities that reduce fleet engine maintenance. Test these claims in your fleet of heavy-duty gasoline or Diesel powered equipment. A Standard Oil Automotive Engineer will help you.

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you.

Stanolube HD

Buy more War Bonds

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ FLEET CONSERVATION SERVICE

Suspension Bridge Spans River in Peru

(*Continued from preceding page*)

the surface soil, to the level of the underlying gravel stratum.

The unwatering problem in connection with the excavation was a difficult one, especially in the formations adjacent to the river. The excavations themselves were effected as the case required, by employing reinforced-concrete or metal caissons. These were not used, however, until after the friable earth strata had been excavated, as the hardness and compactness of the subsoil permitted excavation in open cuts without the use of this equipment. This peculiarity of the soil made it necessary to employ compressed-air drills and a limited amount of explosives. The main anchorage, that of No. 2 pier, has a ground area of 12.70 x 21.50 meters, and the excavation was carried out with twin caissons.

To clear the approach to the bridge on the cliffs of the left bank, it was necessary to drive a cut 20 meters wide, requiring the excavation of 92,628 cubic meters of earth (a cubic meter is 1.308 cubic yards). On the right bank, to reach the approaches to the bridge, a fill 500 meters long and 7 meters wide was required, or a total of 32,000 cubic meters. This earth approach has seventeen concrete pipe culverts 1½ and 2 meters in diameter.

The total volume of concrete of various types and proportions placed in the substructure of the bridge was 11,386 cubic meters, and that for the paving and finishing of the approaches amounted to 374 cubic meters. This required 64,680 sacks of cement.

The total weight of the steel in the bridge is 811 metric tons (a metric ton is 2,205 pounds), the bridge carrying double traffic lanes, with a load allowance of H-15 as designated in North American bridge specifications. The bridge floor is of reinforced concrete, the suspension span having prefabricated bridge flooring as reinforcement. All of the bridge deck carries reflectors to facilitate night traffic.

Defense works will be carried out along the banks of the river, and all of the surrounding area has been reserved by the Government of Peru for the conservation of the existing forest.

The amount of material transported from Callao or Lima to the Aguaytia totaled 3,860 metric tons, not including mechanical equipment or tools. This was done by railway and road during the period of greatest restrictions imposed by the war. Owing to the volume and variety of the cargo, it was necessary to organize a special transport system for the work over the 355 kilometers (220.5) miles of highway from Cerro de Pasco to the Aguaytia.

Phases of the Work

Following the determination of the location of the bridge, Engineers Alfonso Bernoz and Cesar Torreblanca were commissioned to compile a detailed topographic map of the area in the rainy season of 1940-41. The highest floods so far recorded were observed at that time. In the early months of 1943, a study of the subsoil by pipe soundings was carried out by the Sindicato Explorador del Subsuelo.

The necessary clearing and the excavation of the approaches to the bridge site were done between January and April, 1943, by forces of the Ministry of Public Works. This work was completely mechanized, Caterpillar, LeTourneau, and LaPlant-Choate equipment being used.

The thirty-two piers for the approach on the right bank were constructed under contract by Sr. Rogelio Fernandez, from March to June, 1943.

From August, 1943, to May, 1944, there were carried out by government forces the principal excavation adjacent to the river and part of the concrete work for the 33-meter and suspension spans. In this phase of the construction, and up to August, 1944, work was carried on 24 hours a day. The erection of the approach spans was started during this period.

During 1944, the steel for the bridge, fabricated by the American Bridge Co., was transported from Callao to the Aguaytia River.

In June, 1944, the completion of the concrete and the steel erection were undertaken by the firm of Gautier & Kasimir. The structure was completed in June, 1945.

The surveys, direction of the work carried out by direct administration, and supervision of the work of contractors was in charge of Engineer Hermann Baumann, Director of the Huanuco-Pucallpa Highway, with Sr. Alfonso Bernoz as Resident Engineer, and Sr. Eduardo Vega, Assistant Engineer.

Cost of the Work

The cost of the steel work in the bridge was S/982,065.63 (a Sol equals about 15 cents in U. S. currency). The cost per linear meter was approximately S/4,034.40, and the total cost of the project, including engineering surveys and movement of earth for the approaches, is estimated to amount to S/2,962,717.05.

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Creek Levees Rebuilt By Tractor-Scrapers

Earth-Moving Job Repairs Damage Caused by 1943-44 Illinois Floods; Troubles In Shifting Equipment

THE great floods of 1943 and 1944 in the Mississippi River Valley caused damage not only to levees along the banks of mighty rivers but also along many of their tributaries flowing through valuable farm lands. An instance of such flood-damaged levees in this class, recently repaired under the direction of the U. S. Engineer Department, is that of the Nutwood and Spankey levees which lie on opposite sides of Macoupin Creek, a tributary of the Illinois River, about 23 miles above the confluence of the Illinois and Mississippi Rivers at Grafton, Ill. Reconstruction of both levees got under way in the latter part of October, 1944, when the St. Louis District, U. S. Engineer Department, let a contract for $112,325 to the O'Dell & Riney Construction Co., Kirkwood, Mo., for placing 350,000 cubic yards of earth for these embankments, together with the installation of a 12-inch gravity drainage structure in the Spankey levee.

Situated in south-central Illinois and flowing in a westerly direction, Macoupin Creek separates the Nutwood Drainage and Levee District in Jersey County on the south from the Spankey Drainage and Levee District in Greene County on the north. The repairs of these creek-flanking levees started just east of the point where Cole Creek empties into Macoupin Creek, about 2½ miles east of the Illinois River which in this locality flows almost due south. Although the Nutwood levee resisted these recent floods successfully, it was within a few inches of being topped, and was saved only by the additional protection of sand bags and flash boards. The Spankey levee was topped and broken through in 1943, and after being repaired had a repetition of the disaster the following year.

The rebuilt levees are set further back from the banks of the creek than the original levees in order to provide a greater floodway area for the stream. Both levees were strengthened by increasing their height and cross section so that any possible floods will be checked and future damage avoided. Dirt moving on this levee contract was done by scrapers pulled by tractors, and compaction was secured by sheepsfoot rollers. The severe winter of 1944-45 froze the ground, making excavation in the borrow pits impossible and halting operations until spring.

Nutwood Levee

The contractor began by working on the Nutwood levee which protects 11,300 acres of fertile farm land from high water. The section repaired is 7,400 feet long and required 165,000 yards of material. A total of 3,400 feet at the eastern end of the improvement is new alignment, which eliminates the bottleneck in the creek at this point by increasing the width of the floodway. Here the old levee, which was built in 1932, was de-graded, and the material from its embankment used in the new fill. For the remaining 4,000 feet of levee the old alignment was held, and additional material was taken from land-side borrow pits to increase the size of the original levee and raise it about 3 feet in height. The area between the levee and the creek was insufficient to provide material from river-side borrow pits. The amount of earth moved ranged from 1,000 to 4,000 yards per station, and averaged 2,000 cubic yards.

The new Nutwood levee along Macoupin Creek in southern Illinois was built up in 12-inch layers and compacted by at least four passes of a LeTourneau sheepsfoot roller pulled by a Caterpillar D8.

The grade of the crown of the 1932 Nutwood levee averaged 440 elevation above mean sea level, while the new levee has a net grade of 445 at the east

(*Continued on next page*)

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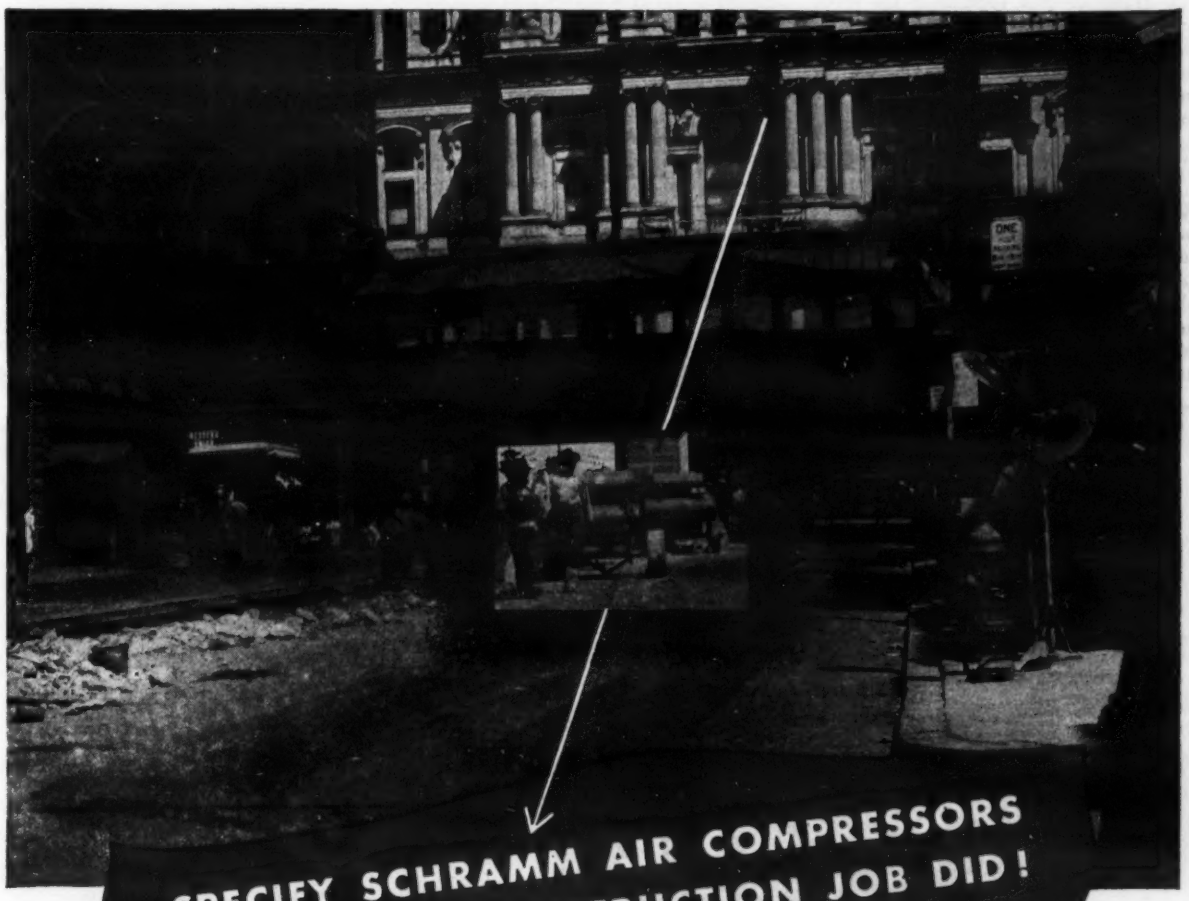

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Creek Levees

(*Continued from preceding page*)

end where it joins high ground, and slopes down to an elevation of 441.2 where it ties in to the old levee at the other end of the contract. The new levee section has a flat crown of 8 feet, with slopes which drop 1 on 3 on the river side, and 1 on 4 on the land side. The river side has a 40-foot berm built on a 1 on 50 slope, and then has a 1 on 3 slope to the borrow area, while the berm on the land side is at least 100 feet wide with a 1 on 100 slope.

In this area the earth is a fairly uniform silty clay which makes good fill material. The average haul from the borrow pits or from the old levee to the reconstruction was 350 feet, with the maximum distance of earth moving around 500 feet.

Specifications required the digging of an inspection ditch 7 feet wide x 6 feet deep in order to detect the presence of any drains or tree stumps in the levee base. Actually the ditch was dug to a width of 16 feet since the contractor did not have a shovel or dragline on the job, and used the scrapers for the ditch excavation.

Moving the Earth

For building the levee, O'Dell & Riney had five Caterpillar D8 tractors pulling two LeTourneau Carryall scrapers with a struck-load capacity of 23 yards, and three LeTourneau Carryalls with a struck-load capacity of 16 yards. In the borrow pits were two other Caterpillars, a D7 and a D8, used as pushers in loading. On the levee was another D8, equipped with a LeTourneau dozer for spreading material, and a dual-drum LeTourneau sheepsfoot roller. The silty clay was deposited and spread in 12-inch layers and compacted by at least four passes of the tractor and roller.

Lynn Gray, subcontractor for a section of the Nutwood levee improvement in southern Illinois, used five Bucyrus-Erie scrapers with International TD-18 tractors, one of which is here working on the land-side enlargement.

Additional equipment was brought to the job by Lynn Gray, St. Louis contractor, to whom was sublet the placing of part of the yardage on the Nutwood levee. His equipment included five Bucyrus-Erie 8-yard scrapers pulled by five International TD-18 tractors, with another tractor of the same size and make acting as a pusher in the borrow pits. Compaction for the fill placed by these units was obtained by a LaPlant-Choate dual-drum sheepsfoot roller, 40 inches in diameter, pulled by an International TD-18 tractor.

The tractor-scraper combinations moved at an average speed of 7 mph and averaged about 3,125 cubic yards of fill placement in a 10-hour day, with a total force of 25 men. Because of the good natural foundation and the quality of the fill, the levee was built to net grade directly, being compacted foot by foot, with no provisions having to be made for subsidence or shrinkage.

The Nutwood levee was completed by December 19, 1944, in a little less than two months' time, with the exception of fine dressing and seeding which were done in the spring. A seed mixture of 15 pounds of red top, 20 pounds of Canada bluegrass, and 15 pounds of domestic rye per acre was used.

Shifting Equipment

Dirt-moving completed, the contractor endeavored to move his equipment from the south to the north side of Macoupin Creek to begin work on the Spankey levee. The equipment had been brought to the job site on a spur line of the Alton Railroad, and unloaded on a siding only ½ mile from the west end of the contract and on the

(*Continued on next page*)

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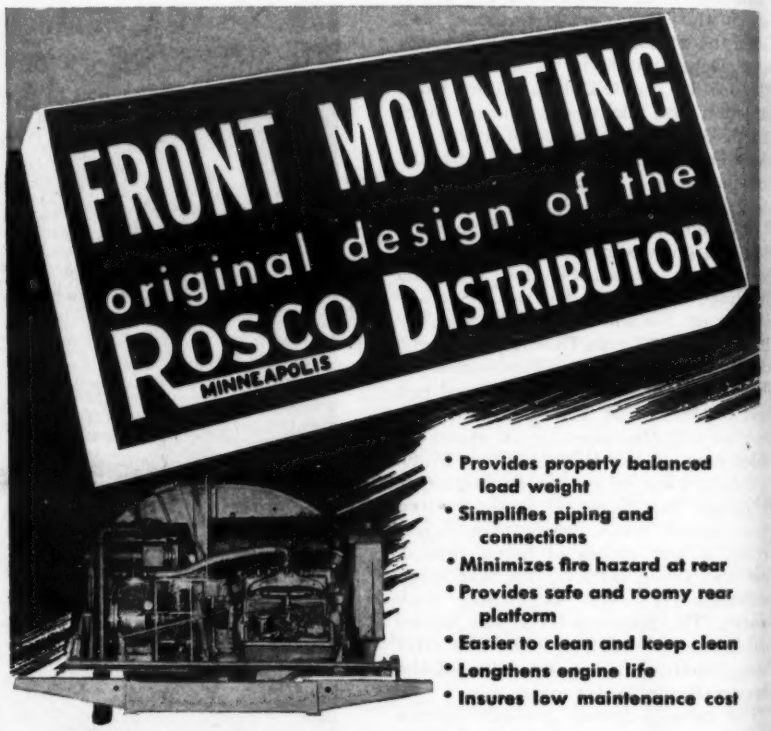

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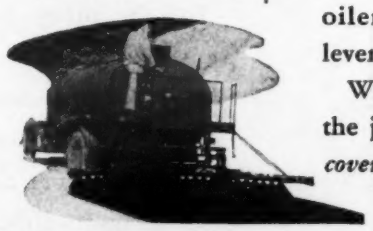

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Creek levees assume importance where great rivers pile up flood waters. Improvement at the Spankey and Nutwood levees along Macoupin Creek will prevent flooding by backwaters from the Illinois, Mississippi, and Missouri Rivers.

Creek Levees

(Continued from preceding page)

outh side of the railroad bridge spanning Macoupin Creek. The railroad ompany, however, was short on flat ars and could provide none right at hat time.

A vehicular bridge spans the creek at he eastern end of the project, but this was constructed in 1890 for the use of wagons and would not support the eavy scrapers and tractors. Macoupin Creek is 100 feet wide and even during he summer low-water stage it is 10 to 12 feet deep with steep banks, so an embankment laid on culvert pipes could not be easily thrown across the stream. The contractor decided to move the equipment across on a barge and rented a tug and barge at St. Louis. The tow sailed 40 miles up the Mississippi, and then 25 miles more up the Illinois and Macoupin Creek to within ½ mile of its destination when it ran aground on a sand bar formed from the deposition of a pump station in the adjoining Eldred Drainage and Levee District. The barge was forced to turn back short of its objective while the contractor had to wait until flat cars were again available. Not until January 9, 1945, was the equipment moved to the Spankey side of the creek, and by that time the ground had frozen so solidly that construction operations were shut down until spring.

Spankey Levee

The Spankey levee was all new construction, being a set-back of from 30 to 300 feet behind the old levee which had been constructed shortly after the great flood of 1903. The realignment is 8,300 feet long and used the old levee for material, with additional earth being taken when necessary from river-side borrow pits in front of the old levee. This old levee had a crown elevation of around 440, and when it was breached in 1943 the water flowed through several crevasses along a 2,000-foot front, flooded the Spankey District of 900 acres, and also the Eldred District of 9,300 acres across Cole Creek.

The new levee required 185,000 cubic yards of fill and has a net crown grade sloped from 441 to 444 elevation. For 300 feet at the eastern end, the levee crown is 20 feet wide to provide an access road to a cluster of houses and a school making up part of the town of Spankey. These buildings were moved anywhere from 60 to 700 feet by the local Levee and Drainage District to provide right-of-way for the new set-back levee. The remaining 5,500 feet of levee has a crown width of 8 feet and the entire levee section has an average height of 16 feet above the natural ground. The land-side slope goes down 1 on 4 to a 50-foot berm which has a grade of 1 on 50. On the river side, the slope is 1 on 3 to a berm varying in width from 50 to 70 feet which also has a grade of 1 on 50.

Work on the Spankey levee started early in March of this year and was completed during the summer, with excavation varying from 1,500 to 3,500 cubic yards per station. As completed, the two flanking levees of the same height are higher than any previous flood, and will afford equal protection to both districts. Drainage from the hills to the Illinois River will be much faster and the threat of floods to the surrounding farm lands will be lessened considerably.

Drainage Structures

Near the eastern end of the Spankey levee a 10-inch corrugated-iron pipe going through the old levee was removed, and a new 12-inch 12-gage galvanized corrugated-iron pipe culvert, 212 feet long, with six 9-foot square diaphragms and a circular cast-steel Calco automatic flap gate, was installed

(Concluded on next page)

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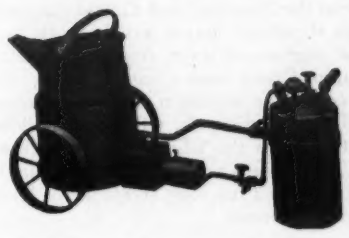

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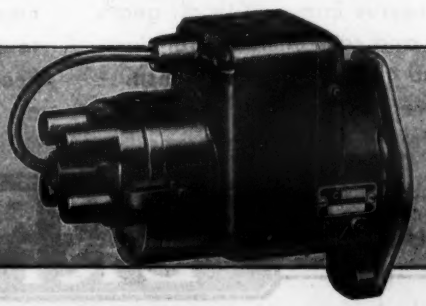

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Creek Levees

(*Continued from preceding page*)

in the new levee. At the southwestern end of the Spankey district, the existing 36-inch gravity drain and pump house were removed under another contract, and a new pump house built to replace the one damaged in the previous floods.

During this year a new triple 8 x 8-foot drainage structure will be built across the mouth of Cole Creek where it empties into Macoupin Creek between the Spankey and Eldred districts. This structure, which will be built in a new section of levee fronting on Macoupin Creek and tying together the levees at the southern ends of Spankey and Eldred districts, will prevent flood waters from the Illinois River backing up into Cole Creek, thereby eliminating the need for long stretches of large flanking levees.

Personnel

The improvements to the Nutwood and Spankey levees in southern Illinois are under the direction of the St. Louis District, U. S. Engineer Department, of which Col. L. B. Feagin is District Engineer, Lt. Col. J. A. Adams is Deputy District Engineer, Lt. Col. E. H. Shutt is Executive Officer, and Lt. Col. W. F. Lawlor, Chief Engineer of the Engineering Division. Capt. L. F. Trost is Engineer in charge of flood control, with C. J. Weaver as his assistant. L. E. Dillow is Assistant Engineer on the earth work and drainage section.

John Casey was Superintendent for the contractor, O'Dell & Riney Construction Co., of Kirkwood, Mo., while Jimmy Williams was Resident Engineer for the U. S. Engineers.

Line of 1945 Trucks For Civilian Service

A number of light and medium-weight truck models are being produced by Reo Motors, Inc., Lansing, Mich. These Reo units provide a wide range of wheelbases, gear ratios, capacities, and power ratings, and are being released through Reo branches and dealers, as fast as they become available for distribution.

Reo 19 CHS and 19 BHS truck chassis have a maximum truck gross rating of 14,000 pounds, a 4-speed transmission, and are powered by a 6-cylinder Reo Gold Crown engine developing a maximum of 89 brake hp. The 19 CHS has a 165-inch wheelbase and measures 104⅝ inches from cab to rear axle, while the 19 BHS has a 145-inch wheelbase and measures 84⅝ inches from cab to rear axle.

The 20 CHS and 20 BHS have a maximum truck gross rating of 15,500 pounds, are equipped with a 5-speed transmission, and are powered by a 94-bhp engine with a 3½-inch bore and 5-inch stroke. They have the same wheelbases and lengths as the 19 CHS and BHS, respectively.

A continued Reo feature is the More-Load design which provides added loading space per inch of wheelbase. It is also claimed that this feature secures better weight distribution, resulting in longer tire life, more effective braking power, and easier riding. The More-Load design, coupled with Reo's wide front axle and special steering-mechanism construction, is said to give an especially short turning circle, which is an advantage when operating in congested areas.

New Davey Dealer

The appointment of the Andruss Equipment Service Co., 1264 Blackstone Ave., Fresno 3, Calif., as dealer for the Davey line of portable and stationary compressors, heavy-duty truck power take-offs, and pneumatic saws in the central California territory, comprising Fresno, Merced, Madera, Mariposa, Kings, and Tulare Counties, has been announced by the Davey Compressor Co., Kent, Ohio. The Andruss firm, which was founded early this year by Cliff G. Andruss, offers complete compressor sales and rental facilities as well as parts for Davey products.

New Youngstown Catalog On Metal Products, Parts

A new 32-page illustrated catalog has just been issued by the Youngstown Steel Car Corp., Niles, Ohio. The facilities and products covered include hot and cold stamping, hand and automatic welding, heat treating and finishing, machining, engineering and design, truck and trailer chassis parts, die-pressed channels, weldments, tunnel liners, and railway-car repair parts.

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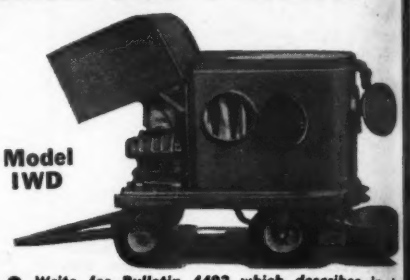

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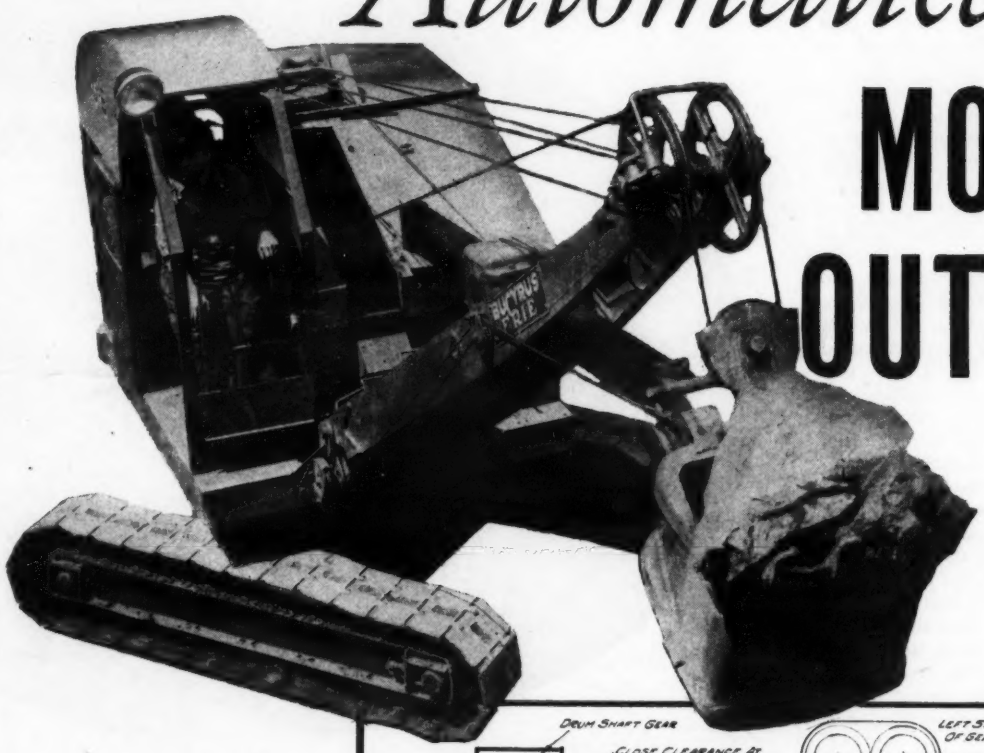

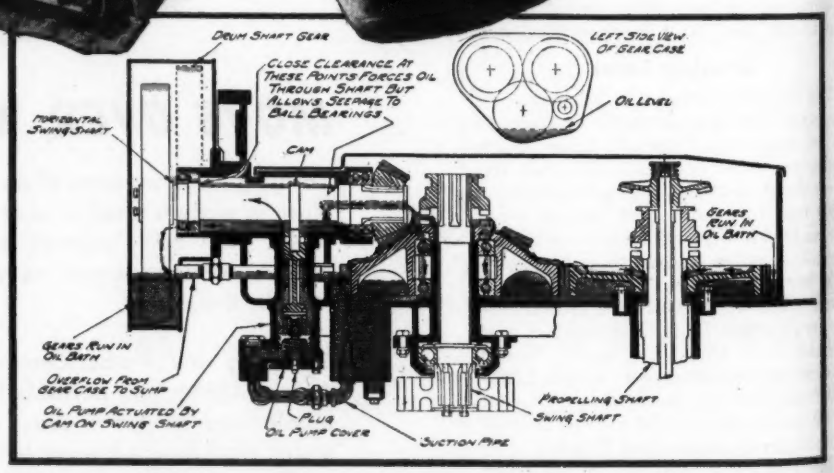
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Large Rural County Has Road Problems

Five Districts, As Large As Some Counties, Administer 600 Miles of Gravel Roads; Dairy Farms Main Industry

By D. R. SAVAGE, former County Engineer, Aitkin County, Minn., Highway Department

ALTHOUGH there are no manufacturing industries in Aitkin County, Minn., its pulpwood production, dairy farms, scattered population, and central schools make its 131.25 miles of State-Aid roads and 469.7 miles of County-Aid, or gas-tax, roads very important in the economic and social structure of the 1,800-square-mile county. It is located in east-central Minnesota with Mille Lacs Lake in its southwest corner. Within the county borders are fifty-four townships with a total population of 15,000.

The county is cut-over territory with the pine about gone, and poplar and scrub oaks have sprung up in its place. At present, with the high price of pulpwood, wood cutters are receiving at least $10 per day. About one man in ten who lives on a farm is in reality a farmer. The remainder live on a "forty" and the young members of the family put in the crops while the father and older brothers go out on construction or other work. Much hay is cut, and dairying is the main occupation of the county, with creameries flourishing. Milk routes are as important as mail routes. The school buses make round trips of 60 miles to the central school. All of this makes the work of the County Highway Department very important to the community.

Road Maintenance

The normal maintenance organization in Aitkin County is made up of one or two power patrols with operators in each of the five county districts. These men are the key personnel in both maintenance and snow removal. Each district also has one or two gravel trucks which are manned with the same personnel. The helpers who do the shoveling and assist at different jobs are hired as required. In normal times there are about twenty-five men on the payroll, but in October, 1944, this was up to sixty-two. This increase in personnel was needed to cut and remove the brush at blind corners, clean culverts, and put up snow fences preparatory for winter. The maintenance equipment consists of three Caterpillar power graders, an Adams, two Austin-Westerns, and a Warco, seven in all. There are also seven 5-ton trucks for snow plowing, including an FWD, two Walter, and four Oshkosh trucks.

The county road equipment works on township and private roads for hire but the condition imposed is that the road must be cleared and smoothed or the county equipment will not be placed on it. The reason for this is that it has been found that practically all serious breakdowns in county equipment have occurred when working on other than county roads.

The County operates a central garage and repair shop at the county seat, Aitkin, where the replacement of worn parts and the welding of broken parts on equipment can be done. There are also two district garages in connection with the central shops. In addition, there are, in outlying towns, five garages with small amounts of shop equipment for minor adjustments and repairs.

Bridge Problems

As the Mississippi River meanders through Aitkin County, there are several long bridges. Navigation is a thing of the past in this section so that the swing spans of yesteryear have been made stationary. Since the repair of these long bridges is a very considerable burden to the County and requires more experienced bridge crews than it has been able to assemble, the State is generally called upon to repair these bridges with its crews. The financial burden is shifted back to the County, as the law requires that the County take care of all bridge repairs except the smallest structures on the township roads. There is no regular county bridge crew as there are a number of small contractors in the county who have bridge tools, such as pile hammers, etc., and who do new construction.

The law requires a bridge inventory every two years and, although this has been neglected in the past, one was made in 1944. We strive to make a record of any new bridges, noting the kind and length of piling and floor. In the future, it is planned to make a definite study to determine what timber is best for the different parts of our bridges. We have put in several treated-timber bridges and have started using laminated treated-timber culverts.

Finances and Organization

The County has had considerable difficulty with its finances so that at present county warrants draw 6 per cent. The issuance of warrants was overdone about 10 years ago to the amount of $80,000. Since then the Conservation Department of the State has assumed a large part of the indebtedness and the County has been placed on a rigid budget basis, paying cash for everything, including materials and labor.

The five Commissioners are elected by the people for four-year terms, and the terms are staggered so that two are elected each two years, thus preventing an entirely new board coming into office at one time. The County Engineer is appointed for a 2-year term by the County Board, the appointment being made as of May 1, so that the term of the Engineer does not start at the same time as the term of the Commissioners. In this way, the appointment is not unduly influenced by the heat of political campaigns. The County Highway Department is supposed to be organized on a unit basis, but owing to the size of the districts, some of which are larger than many counties, each Commissioner handles the work and purchasing in his own district, using the County Engineer for professional work and the handling of the different budgets for the various districts.

The present Commissioners are Ed. Chute, Chairman, Oscar Jacobson, Ed Yetter, E. G. Simpson, and C. E. Beerbower. The author served as County Engineer for five terms.

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"Is this little button the starter?"

Meetings Urge Start Of New Highway Link

Meetings in Detroit and Chicago were held recently to secure the support of business and civic leaders and of a large variety of groups for the early construction of a modern expressway between those two cities.

To the meetings, which were sponsored by the Automobile Club of Michigan and the Chicago Motor Club, two of the largest affiliates of the American Automobile Association, were sent congratulatory messages from many national road leaders, including Senator Carl Hayden of Arizona, Vice Chairman of the Senate Committee on Post Offices and Post Roads; Representative J. W. Robinson of Utah, Chairman of the House Committee on Roads; Thomas H. MacDonald, Commissioner, Public Roads Administration; Herman MacDonald, Massachusetts Commissioner of Public Works and President of the American Association of State Highway Officials; and Pyke Johnson, President of the Automotive Safety Foundation.

Commenting on the significance of the event, H. J. Brunnier of San Francisco, President of the AAA, said in part: "It is to be hoped that the meetings simultaneously held in Chicago and Detroit will awaken other cities throughout the country to the importance of taking time by the forelock and planning now for speeding up the beginning of construction on the National System of Interstate Highways. Every link completed will add that much to the efficiency and safety of highway transportation."

In a free society, competition keeps everyone in line—each one is restrained by his competitors. If factory workers earn more than farmers, then farm boys will leave the farms and come to the cities, and this migration will tend to equalize the incomes. The free society is self-regulating.

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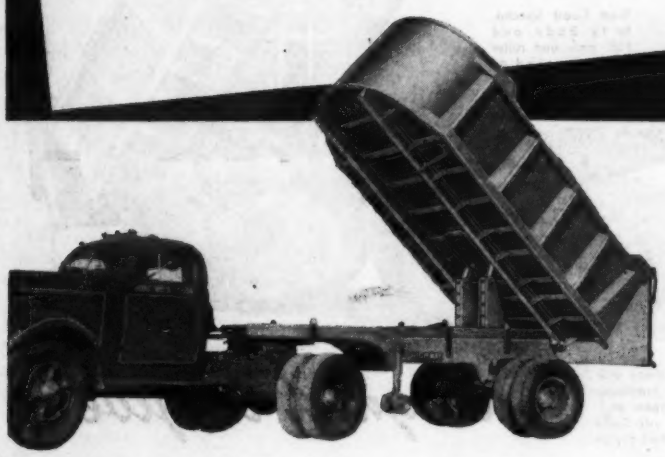

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Needed Expressway To Be Started Soon

Shirley Memorial Highway From Pentagon Network to U. S. 1 in Virginia Will Be Early Post-War Job

+ THE No. 1 post-war highway project in Virginia is the completion of the 17-mile Henry G. Shirley Memorial Highway honoring the man who headed the Virginia Department of Highways for nineteen years. Although the project was initiated by Virginia, the first section of the dual expressway was built in two parts by the Public Roads Administration to connect the Pentagon Network, or "Maze" as it is still called even by those who visit it frequently, with Va. 7 at the Fairfax County line. The next 14.6 miles, which will be built in several post-war contract sections, will carry the expressway around several communities and connect with U. S. 1 at the dual steel bridges over Occoquan Creek, which is the dividing line between Fairfax and Prince William Counties.

The PRA Section

The section built by the Public Roads Administration is 2.4 miles long. The southbound highway was completed in April, 1944, while the northbound highway was opened to traffic in December, 1944, at a total cost of $1,665,000 including right-of-way and landscaping. Financing was 100 per cent by access-highway funds.

This initial section, with which the 14.6 miles to be built later by the State of Virginia will connect, has two 24-foot roadways with a uniform 30-foot grass center strip. The slopes are flat and well rounded at the top, but, because of wartime restrictions, planting was limited in quantity to that required for the control of erosion. All slopes, however, were seeded or sodded.

Initial Post-War Section

Virginia is continuing the Memorial Highway as an expressway, and not as a parkway with elaborate planting. The plans have been completed for the first 2.709-mile post-war section and most of the right-of-way has already been acquired. This section, beginning at the PRA section, which ends at the Arlington-Fairfax county line with an interchange to Va. 7, will continue to an intersection with Va. 236 at Lincolnia. Route 7 is the through route from Alexandria to Falls Church and Route 236 is the Alexandria-to-Fairfax highway.

This initial project, the estimated cost of which has not been announced as no contract has yet been awarded, will require 62 acres of clearing and grubbing, 835,895 cubic yards of regular excavation, 76,617 square yards of reinforced-concrete pavement 10 inches thick, 274 cubic yards of Class A and 72 cubic yards of Class C concrete, with 34,040 pounds of metal reinforcement. The plans call for a total of 9,212 feet of pipe from 12 to 60-inch diameter, 28,983 cubic yards of subgrade treatment, 670 square yards of dry riprap, and 433 square yards of mortar riprap. A total of 4,375 square yards of plain-cement concrete-block gutter will be installed, and 14,020 cubic yards of topsoil, 2,670 square yards of sod for a drainage channel in the median strip, and 52 acres of seeding will be required.

The structures will consist of a 182-foot reinforced-concrete-beam four-span bridge over Route 350 near Lincolnia, a pair of 26-foot reinforced-concrete arch culverts over Holmes Run 4.5 miles from Alexandria, and a 78-foot 6-inch steel-truss bridge over the same stream on a service road which will be affected by the new expressway.

Balance of Expressway

At Lincolnia the expressway will have a cloverleaf interchange to Route 236 and then a semi-cloverleaf interchange 4 miles to the south to Route 644. One mile south of Route 7 there will be another semi-cloverleaf to Route 716 and if traffic later requires it this will be converted into a full cloverleaf for which the State has already acquired the right-of-way. There will be still another semi-cloverleaf about 3 miles south of Route 644 for a relocation of Route 617, and another 3 miles farther south at Lorton for Route 642. In this section the highway will pass through Fort Belvoir property close to Accotink Station on the Richmond, Fredericksburg & Potomac Railroad.

The junction of the expressway with U. S. 1 at Occoquan Creek will be just north of the new dual bridges over the creek. When the State created the dual highway south of this point, it took an old railroad bridge for one of the pair and remodeled it and then built a new duplicate bridge.

(*Concluded on next page*)

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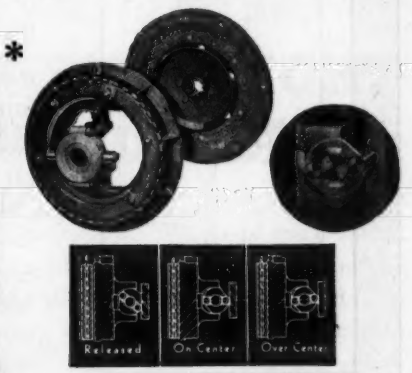

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Needed Expressway To Be Started Soon

(*Continued from preceding page*)

Progress on Plans and R/W

Of the approximately 11.9 miles of highway beyond the section for which plans are complete, there is a 4½-mile section on which plans are practically finished but not all of the right-of-way has been secured. This is followed by a 2-mile section to Route 617 for which plans are complete, but all of the right-of-way has not been secured. For the balance, the plans are being worked on but no right-of-way has been acquired. Under pressure, it would be possible to complete all plans for contract lettings within two months, but the acquisition of the right-of-way is another problem.

When condemnation proceedings for right-of-way are started in Virginia, the State makes a deposit with the court and thereby is permitted to start work at once. Following this, the State must start legal action within sixty days. If the State goes into court without making the deposit, all work is held up from thirty to sixty days.

On the 14.6 miles of highway under discussion the terrain is heavy rolling country requiring 50 to 60-foot cuts and fills. The right-of-way which must be acquired is mostly wooded land in the hands of private owners who are generally cooperative and are asking no more than a fair price for the property taken for the project.

The cost for these 14.6 miles of the Shirley Memorial Highway will be under $5,000,000 exclusive of interchanges. It will be open to all traffic, with no restriction on its use by trucks.

Features of Design

The new highway will consist of two 24-foot roadways paved with 10-inch uniform reinforced-concrete slabs, with a center strip varying from 14 to 84 feet wide. It is designed as a limited-access highway as it is on the National System of Interstate Highways and the design meets all requirements for that system and for a safe speed of 70 miles per hour, although this is far in excess of any anticipated extension of the state speed limit. A speed limit of 25 miles per hour is to be imposed at all interchanges.

The maximum upgrade on the highway will be 3½ per cent and the maximum downgrade 4½ per cent. The curvature is to be a maximum of 1 degree except on the cloverleafs. There will be no superelevation on the main road, but there will be on the cloverleaf interchange roads.

The two roadways will be carried at different elevations where this improves the grade and ample right-of-way is available. It is at the point where the roadways will be at different elevations that the widest median strip will occur. There are to be no side slopes greater than 2 to 1 except a few at interchanges.

Financing

This project is to be financed with $2,894,129 of strategic-highway network funds made available under the Defense Highway Act of 1941, $423,103 of Federal grade-crossing funds, and $1,000,000 of state funds. The interchanges at Routes 1, 236, and 7 are to be financed with $479,000 of regular Federal Aid and $279,000 of state funds.

Personnel

The Henry G. Shirley Memorial Highway is being planned under the direction of General J. A. Anderson, Commissioner, and C. S. Mullen, Chief Engineer of the Virginia Department of Highways, assisted by P. B. McWhorter and Joseph Barnett of the Public Roads Administration.

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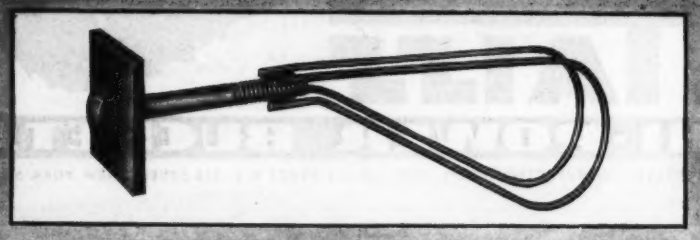

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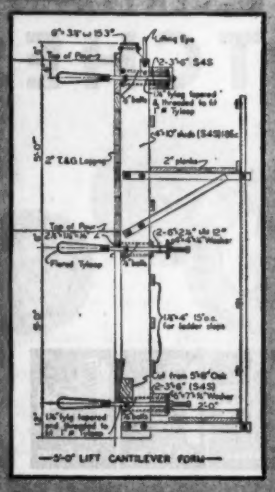

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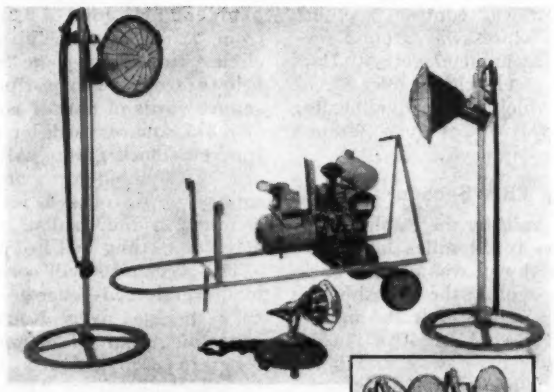

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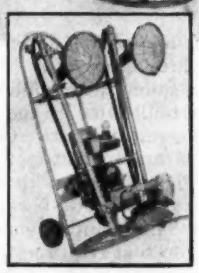

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The Truk-Loder will do most of the operations of a large and costly shovel—loading dirt, gravel, crushed stone, street patch material, snow, leaves or refuse. The operations are economical and the Truk-Loder is priced within the range of the smaller contracting companies and smaller communities.

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WHEN oxygen and acetylene cylinders leave the charging plant or warehouse of the manufacturers of these gases, they are in proper condition for the purpose intended. But they must not be abused on the job if they are to remain in this condition.

Because these cylinders are designed to transport gases under high pressure, regulatory organizations require close inspection and careful testing each time an empty cylinder is returned to the supplier for refilling. Careless handling may result in damage that makes it necessary to discard cylinders that are greatly needed at the present time.

Avoid Dents and Scratches

When cylinders are inspected by the supplier, it is necessary to discard those that have injurious dents and cuts in the surface of the metal. Such damage can be avoided by using a cradle or platform when handling cylinders with a crane. Never use a lifting magnet, for the cylinder may become dented when it jumps to the face of the energized magnet. And—what is even more likely—the cylinders may be dropped from the magnet while still above the ground and thus be severely damaged. A sling should never be used for lifting cylinders either, for they can easily slip out and fall.

Avoid striking cylinders violently against each other. When loading cylinders into freight cars, be sure to provide sufficient bracing to prevent their shifting while in transit. When cylinders are transported by truck or other vehicle, they should be securely fastened in position to avoid their rolling, falling, or being knocked about. Empty cylinders dent more easily than filled ones, because they lack the cushioning effect of internal pressure.

Avoid storing cylinders where heavy moving objects may strike them or fall upon them. Elevators and gangways are particularly exposed spots where cylinders can be readily damaged by industrial trucks. Also if cylinders are stored in areas served by overhead cranes, they may be struck by the crane hooks.

Keep cylinders from being knocked over while in use. Place them upright and keep them in that position by mounting them on a cylinder truck or chaining them to a building column or other structural member. If no better means are available, the oxygen and acetylene cylinders may be suitably fastened together to increase their stability.

Use cylinders only for the purpose intended. Oxygen and acetylene cylinders are specially made for transporting these gases in a compressed state. Never use them as rollers or supports even if considered to be empty; such use is certain to damage the cylinders.

Spare the Surface

Not much time is required to repaint a cylinder when it becomes scarred in service, but it may take considerable time to prepare the cylinder for painting if its users have been careless. For example, cylinders occasionally arrive at the charging plant covered with tar, grease, or concrete; this must be laboriously removed and the surface thoroughly cleaned before a new paint coat is applied. The practice of marking empty cylinders with a painted "X" or "MT" also makes unnecessary added work for plant personnel. Since cylinders must make many round trips before repainting, any mark to indicate an empty should be made with a non-permanent material. Chalk is satisfactory, but keel or lumber crayon or paint is hard to remove. If a space is provided for storing empty cylinders separate from full cylinders, only a temporary "empty" indication is needed.

Occasionally a cylinder is even returned painted an entirely different color from the original. Sometimes this is done by operators of repair trucks who want to have the equipment mounted on the truck match the color of the truck. It may also happen that a cylinder on shipboard is painted along with the rest of ship. This practice is not only costly and time-consuming at the cylinder-charging plant, but it is actually dangerous as it may obliterate the label which identifies the gas contents of the cylinder. Never judge the contents of the cylinder by its color; read the label and be sure. If there is no label, do not use the contents.

A condition which can damage the surface of a cylinder so badly that the cylinder must be discarded is caused by arc burns. These result from allowing the cylinders to come in contact with live wires, third rails, or ground wires from electrical equipment. Burns can also occur when the cylinder is in contact with benches or tables on which electric welding work is being performed. Electric welding operators have been known to clean the end of an electrode by tapping it on a nearby cylinder. Every time a cylinder gets an arc burn it means one less cylinder to deliver oxygen or acetylene to the field.

Avoid Contamination

The Linde Air Products Co. points out that all Linde oxygen meets the purity requirements of the United States Pharmacopoeia, so that it is pos-

(Concluded on next page)

Oxy-Acetylene Tips Photo

A carelessly handled blowpipe ruined this cylinder, and also might have caused a serious accident.

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G-200 R LIGHT-WEIGHT WAGON DRILL

AN outstanding feature of the G-200 R Light-Weight Wagon Drill is the sturdy rotary air motor equipped with graduated air control, worm transmission and feed chain — assuring steady feed, quick return and ample power for pulling tight steel.

Light but rigid tubular carriage frame, mounted on 3 roller-bearing wheels with easy-riding pneumatic tires, enables G-200 R to be moved readily and rapidly over rough terrain. Sliding cone permits quick adjustments to ground conditions. G-200 R Wagon Drills available with CP-50 (3″), CP-60 (3½″) or CP-70 (4″) Drifters. Write for full data.

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Oxy-Acetylene Tips Photo
Oxygen and acetylene cylinders are in short supply. Carelessness in handling resulted in the dent shown in this photo and put another cylinder permanently out of service.

Be Kind To Cylinders; Abuse May Ruin Them

(Continued from preceding page)

sible to use a cylinder of oxygen from any industrial supply for medical purposes, should the need arise. These cylinders must, therefore, be kept free from internal contamination.

One of the best ways to prevent internal contamination is to keep the cylinder valves closed when the cylinder is not in use. The fact that the cylinder is exhausted of its contents is no reason for leaving the valve open. For example, an empty cylinder could easily be knocked over so that its valve is immersed in water. If the sun should beat down on the cylinder for a few hours during the day, the air inside the cylinder would expand, but at nightfall, the cooler air would contract and would suck in water with it, thus contaminating the interior of the cylinder.

Cylinders with open valves are particularly likely to become contaminated in shipyards and dry docks, where they may be knocked over. Any salt water taken into the cylinder not only contaminates the interior but causes internal corrosion, which ultimately weakens the cylinder wall. Keep valves closed to keep the interiors clean.

Be Careful of Threads and Valves

Oxygen-cylinder valves are made of brass. For this reason the regulator connection should not be tightened too much as this is likely to strip the threads. Outlet threads are also frequently damaged when the valve protection cap is placed on the cylinder. Ironically, this cap, which has the purpose of protecting the cylinder valve, sometimes damages it because the cap is carelessly allowed to strike the inlet threads when it is being placed in position.

Because of the high pressure, 2,200 pounds per square inch, in an oxygen cylinder, a special type of valve is required. Two different types of valves are used on Linde oxygen cylinders, but neither valve can be repaired in the field. Never try to repair an oxygen-cylinder valve; place a tag on the cylinder with the notation that the valve is defective and return it.

Oxygen-cylinder valve handwheels are not supposed to turn so easily that they can be spun with one finger, as can be done with the pressure-adjusting screw on the regulator, but they can be turned readily by hand. Never use a wrench to open or close valves and never hammer the handwheel for this purpose. Such abuse may break off the end of the operating screw, making the valve unserviceable and often resulting in the loss of the handwheel.

Keep Caps in Place

The valve protection cap is provided on the cylinder for one purpose only, to protect the cylinder valve from damage. To accomplish its purpose, the valve cap should always be kept in place except when a regulator is to be attached to the valve. All cylinders should be returned to the supplier with valve protection caps in place.

Keep 'Em in Service

Remember, oxygen and acetylene cylinders are your gas supply line. To assure the supply of gases that you need, take care of the cylinders you receive and keep them in service. Avoid dents and cuts that may make it necessary to discard the cylinders. Keep their surfaces clean and free from arc burns. Keep cylinder valves closed when cylinders are not in use, to avoid internal contamination. Be careful of valves and outlet threads.

By observing these simple precautions you can help to keep existing cylinders at work, but one more rule should be observed since the available supply is so limited. That rule is: return cylinders promptly when they are empty and keep on hand only as many full cylinders as you require.

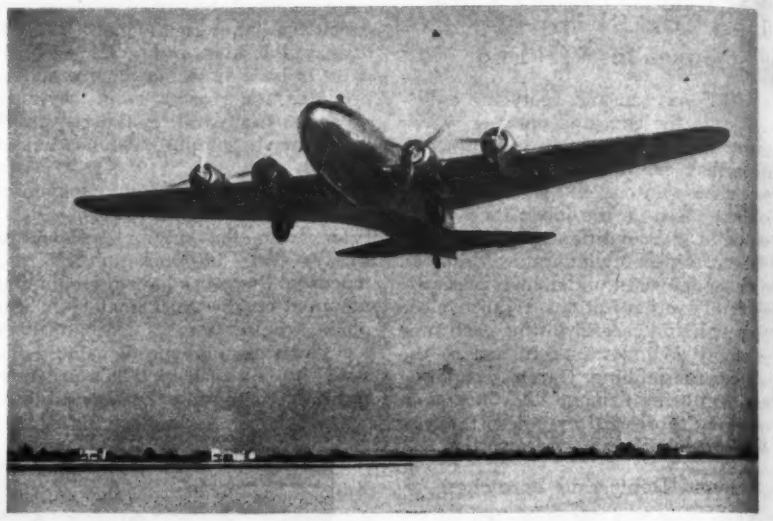
Development of Rivers In India to Be Studied

A study of the potentialities of India's rivers and assistance in the coordinated development of those passing through more than one province or state are the purposes of the newly created Central Waterways, Irrigation, and Navigation Commission in India. This agency will serve as a central fact-finding, planning, and coordinating agency which will conduct surveys regarding the planned utilization of water resources and will encourage the control, conservation, and regulation of water and waterways.

Several districts of the Punjab Province will be irrigated by the proposed Bakhra Dam which is estimated to cost about $90,000,000, according to a recent report in *Foreign Commerce Weekly*. This dam will create a reservoir 55 miles long and up to 3 miles wide. Engineers are being sent to the United States by the Punjab Provincial Government to study the construction of high dams and hydro-electric installations.

A multi-purpose project for developing the Son River valley is under consideration by representatives of the Central Government and the governments of the United Provinces, Central Provinces, and Bihar. It is proposed to use the water of the river for increasing irrigation and developing power, navigation, and flood control.

In addition, the Government of Mysore has authorized a five-year program comprising 23 new irrigation projects in that state. The program includes the construction of two diversion dams, one across the Tunga River and the other across the Kagehalla River.



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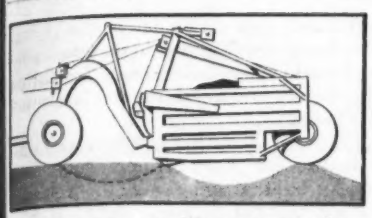

By making a cut with a scraper when the wheels start downhill, you can get bigger payloads faster.

Fast Pan Loading Without a Pusher

A method of speeding the loading of both tractor-drawn scrapers and Tournapulls has been reported by Adrian C. Culver of Glasgow, Mont., who was in military service in the Aleutians and spent part of his time instructing new operators. Culver admits that the method is not entirely new but it also does not seem to be very widely known. When an operator gets on to the hang of the "breathe-easy" action, he can frequently eliminate the use of a pusher tractor, no mean saving on any job.

Culver's method is this: When you are using the pumping action in operating a Carryall, space the "pumps" to get them even. Then, as the rear wheels come over the center or top of the first "pump", drop the blade and cut while the rear wheels are on a downhill push. At the same time the rear wheels are on the downward motion, lower the apron. If you do otherwise, you will be cutting while the rear wheels are moving uphill and the scraper will pull twice as hard. It all takes practice, but it does make it possible to get just as large a payload as if you had a pusher. The heavier the load gets as it piles up, the more it will push as the wheels go downhill and that helps still more to pile it on.

Culver first reported this in the LeTourneau *Co-Operator* to which we are indebted for the illustration.

New Modern Garage Has Radiant Heating

Both state and county highway departments throughout the United States are giving serious consideration to the construction of new storage and service garages to replace many of the older structures now in use. These post-war plans include improvements in arrangement and all facilities. Among these is the question of heating.

Radiant heating offers many advantages over radiators and other types of heating. Warm dry floors assure a maximum of comfort for mechanics and thereby reduce their fatigue. Warm floors melt snow and ice dropping from trucks and the resulting moisture is evaporated. Future partitioning of the building can be done without interfering with the heating system when the heating pipes are laid in the floor of the structure. Quick recovery of normal temperature is assured despite frequent opening of large overhead doors. Large glass areas can be used without creating drafts in the window zones. The economies of basementless construction are made practicable and such heating results in lower fuel consumption, it is reported.

A. M. Byers Co., Clark Bldg., Pittsburgh, Pa., has issued a Bulletin PO6741 describing a modern industrial garage built with radiant heating. Copies of this Case Study No. 5 may be secured by writing direct to Byers and mentioning this item.

Fast Print Production Described in New Folder

The features of the new Bruning Model 41 Printer-Developer for the speedy and economical production of black and white prints are described and illustrated in a new 4-page folder recently issued by the Charles Bruning Co., Inc., 4754 Montrose Ave., Chicago 41, Ill. This Bruning Model 41 combines both printer and developer in a single compact unit which is easily operated by inexperienced workers. With a printing and developing width of 46 inches, the Model 41 exposes and develops black and white prints from roll stock or cut sheets up to 6 feet per minute, depending upon the transparency of the original, and has a mechanical speed up to 7½ feet per minute.

State and county engineers and contractors confronted with the problem of producing plans, drawings, sketches, and similar material for post-war work may secure copies of this new folder entitled "Just the Ticket" direct from the manufacturer. Just mention this review.

Highwaymen—Where's the hold-up? Plan tomorrows' highways today!

Buffalo-Springfield News

George P. White has been made Eastern Sales Manager of the Buffalo-Springfield Roller Co., Springfield, Ohio, manufacturer of a line of road rollers. Mr. White has been with the company since 1909 and most recently served as Philadelphia Branch Manager.

Following discontinuance of the Buffalo-Springfield office in Philadelphia, the company has appointed the Service Supply Corp., 2020 Erie Ave., Philadelphia, Pa., as distributor. In the New England territory, the Clyde Everett Equipment Co., 296 Binney St., Cambridge, Mass., is now handling Buffalo-Springfield products. Both distributors offer complete service facilities.

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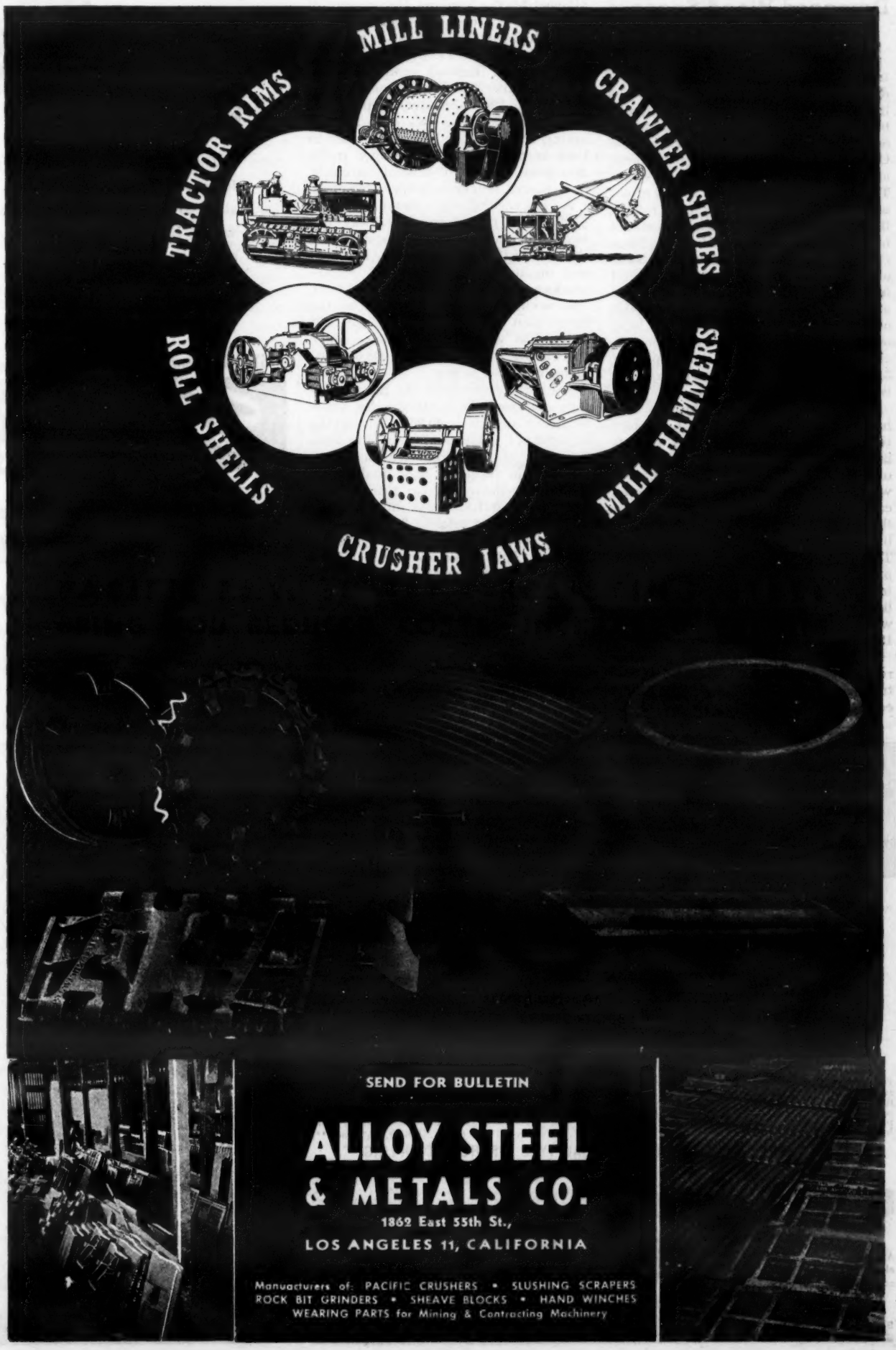

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"Okay, now shake the cement offa me."

Damaged Wood Spans Repaired by Contract

The repair of two creosoted-timber trestle bridges which had been damaged during the Army war maneuvers was included in the contract for 21.5 miles of base construction and surface treatment on U. S. 190 in southwestern Louisiana. One bridge had eighteen 15-foot spans, and the other had five 19-foot spans. The bridge work, which consisted of renewing broken members and raising the bridges about 6 inches, was sublet to Newsom Bros., of Columbia, Miss.

These bridges are supported on bents of four 12-inch piles spaced at 6 feet 4 inches, sway-braced, and sash-braced at ground level with 3 x 10's. The piles are capped with 10 x 12's 22 feet long, over which are 6 x 14-inch stringers, eleven to the span. Creosoted planks, 3 x 10's and 3 x 12's, form a clear roadway width of 18 feet 9 inches.

The planking on these bridges first had to be removed in order to replace broken joists or caps. Where the bents had been damaged, the piles were cut off at a uniform level, then capped again with a standard-dimension creosoted cap, plus an additional cap of whatever thickness was required to bring the bridge back to its original elevation. This method of "double capping" was preferred, for permanence and strength, to the insertion of shims. A total of 610 linear feet of creosoted-timber piles was used in the repairs, together with 190,473 FBM of creosoted timber.

The subcontract price for the bridge repairs was $42,316.50. The entire contract is known as a "reimbursable project", that is, the State pays for the work, then presents a claim to the Government for reimbursement since the reconstruction was necessitated because of damage done to the road by the Army during war maneuvers. Work was started in October, 1944, and was completed at the end of May, 1945.

By-Pass Economics, A Study in Saving

Soon after Contractor E. W. Hechler started the construction of the 4.161-mile Fredericksburg, Va., by-pass, he realized that the number of men permitted on the job by the War Manpower Commission would not be sufficient to get the much-needed facility completed within the 270 calendar days allowed by the Virginia Department of Highways' contract. He sought the aid of the highway department in securing permission to add 150 men to his force. The study in highway economics presented to the WMC by General J. A. Anderson, Commissioner, Department of Highways, shows how even a small saving in distance, 1.03 miles, and in time is compounded by heavy traffic into great savings of critical materials, man-power, trucks, and operating costs.

A very careful study was made of the traffic over the existing highway between the two ends of the by-pass. This showed 1,615 passenger cars, 143 light and medium trucks, and 925 trailer-trucks per day, a total of 2,683 vehicles. The saving in travel distance by the completion of the by-pass is only 1.03 miles, but when 2,683 vehicles make this saving it amounts to 1,008,674 vehicle-miles per year.

A liberal estimate of the life of tires for passenger cars is 20,000 miles, while for truck tires it is 40,000. The saving of 1,008,674 vehicle-miles by the construction of the Fredericksburg By-Pass would result in an annual saving of 121 new passenger-car tires, 7 light truck tires, and 87 heavy-duty trailer-truck tires, or a total of 215 new tires.

Now let us consider the savings in gasoline. This would amount to 115,404 gallons per year, and the man-power, based on the time saved in driving 1.03 miles less, would be 191,555 man-hours.

Based on the value of trucks, taking an average figure of $6 per hour for heavy-duty trailer trucks, the completion of the by-pass would save $220,135 per year. Exclusive of the time saved, there would be a saving in operating costs of $59,118 per year.

These were the forceful arguments which caused the War Manpower Commission to increase the ceiling from 60 to 150 men so that the contractor might complete the project on time.

Needless Accident

An employee was taking up slack in a cable regulating the height of a bull-dozer. He grasped the cable with his left hand, this action let in the clutch. His hand was drawn under the cable and against the hoist drum, fracturing the fingers and crushing and lacerating his hand.

Cables should always be grasped sufficiently far back from drums and blocks so that they may be released before the hands are caught. If it is possible to guide the cable without grasping it, by a stick or otherwise, so much the safer.

Sorry! None Available Now

100% of Sterling's extensive plant facilities is being utilized for essential war production. Naturally, this makes it impossible to ship wheelbarrows for civilian use. As much as we would like to take care of our good customer friends, the needs of the present conflict must take precedence. It has been a real pleasure to serve you in the past 40 years, and the entire Sterling organization is looking forward to serving you again in the postwar era.

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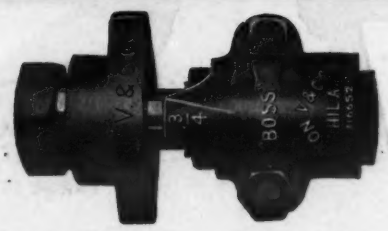

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Many New State Laws Affect County Roads

Financing Methods Altered Or Improved to Strengthen Position of County Boards And Increase Construction

TWENTY-FOUR state legislatures which met this past spring passed important new laws affecting the financing of county highways in one way or another.

Alabama: A new law provides for state-aid in the construction of county roads at the beginning of the post-war Federal-Aid highway program and for three years thereafter. The State Highway Department is to set aside monthly for the use of each county 167th of one cent of the state's gasoline tax. Any amount unused to the credit of each county will be held by the State Highway Department for matching purposes during or before the close of the next fiscal year. The law appropriates to the Highway Department the sum of $2,500,000 to be held in reserve and used, 167th in each county, on farm-to-market roads without matching by the counties, but to be matched with a like sum of Federal-Aid money in each county when monies appropriated by the Federal-Aid Highway Act of 1944 and allocated to Alabama for secondary roads are available.

Arkansas: SJR 5 provides for a constitutional amendment that the maximum county-road tax that may be levied with the approval of the majority of voters in a county may be 10 mills instead of 3 mills. S. 46 authorizes the payment of part of valid outstanding funding bonds issued by counties for building bridges; the Highway Commission is to ascertain from county clerks the proper amounts to be paid. S. 266 appropriates for counties from the County-Aid Fund $2,355,504 for each of the next two fiscal years from the County Highway Fund, Municipal Turnback Fund, and other funds. S. 304 amends the provision requiring the State Treasurer to deduct from counties' turnback allotments sufficient to pay (1) 75 per cent of maturing bonds issued by road improvement districts after February 4, 1927, and (2) 50 per cent of maturing bonds and interest of road districts created after 1931, to provide for payment of such bonds from any surplus over the amount so deducted.

Delaware: S. 212 appropriates funds to purchase past-due interest coupons on certain highway-improvement bonds and state-aid bonds issued by New Castle, Kent, and Sussex Counties during the fiscal biennium ending June 30, 1947. S. 213 authorizes the State Treasurer to purchase highway-improvement bonds and state-aid bonds issued by these same counties during the fiscal biennium named in S. 212.

Illinois: H. 19 requires only 25 legal voters on a petition for an annual tax not to exceed 33.3 cents of each $100 assessed valuation for the construction of hard-surfaced roads or the improvement of earth roads. H. 328 defines state-aid roads as all highways designated by county boards and approved by the Department of Public Works and Buildings. S. 232 creates a commission to investigate the present use of dirt roads and farm-to-market roads.

Indiana: H. 370 confers on the State Highway Commission the power to cooperate with the Federal and other units of government for post-war highway projects. H. 430 requires all gasoline and motor-vehicle funds to be specifically appropriated; it further provides a method of appropriating funds to counties for highway purposes.

Iowa: H. 212 fixes the annual allocation of road funds for the biennium beginning July 1, 1945, at $1,000,000 for the secondary-road program and $4,600,000 for primary roads.

Kansas: SCR 14 directs a legislative council to make a study and report relative to county and township roads. S. 35 provides a tax levy not exceeding one mill to create a special road and bridge fund in counties operating under the county-road unit system. S. 147 designates a secondary-road system which includes farm-to-market roads, rural mail routes, and school-bus routes, the construction and maintenance of which are placed under the jurisdiction of the Board of County Commissioners of each county. In the selection of the mileage to be designated in each county for inclusion in the secondary system, consideration must be given to the inclusion of principal county and township roads so located as to provide adequate inter-town and inter-county connections to serve best the rural population of the state.

Maryland: S. 386 provides for the acceptance, application, and administration of Federal funds to be allotted to the state for the benefit of the state highway system, the street and highway system of Baltimore City, the second-

(*Continued on next page*)

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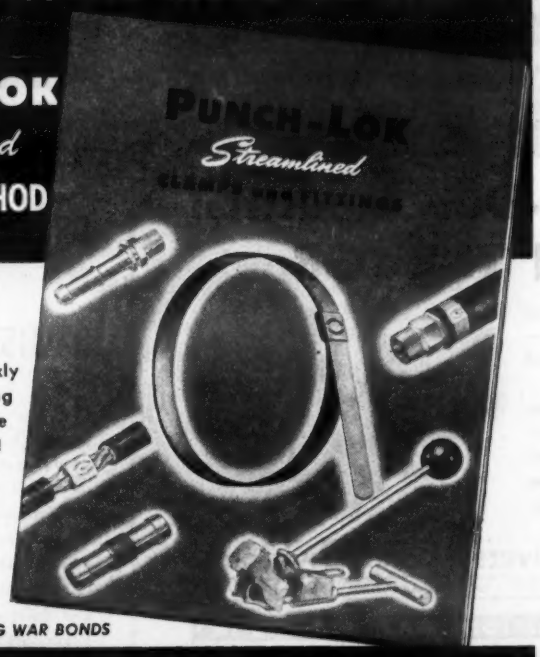

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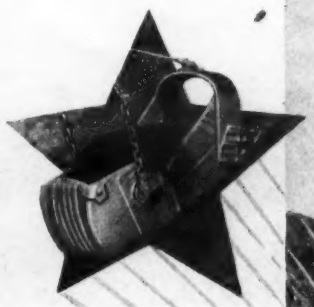

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Many New State Laws Affect County Roads

(*Continued from preceding page*)

ary-road system of counties, and the street and highway systems of other political subdivisions.

Michigan: H. 148 provides for county planning and the creation, organization, powers, and duties of county planning commissions.

Minnesota: H. 370 apportions $25,000 from the gas tax to reimburse the Trunk Highway Fund for the cost of maintaining a County Highway Division in the Department of Highways. H. 532 authorizes the county board of any county to use 25 per cent of its share of the gas-tax proceeds to pay bonds issued for road and bridge purposes, including bonds issued for matching Federal-Aid under the provisions of the Federal-Aid Highway Act of 1944. S. 984 authorizes county planning commissions to improve areas outside of second-class cities. S. 754 authorizes county boards to appropriate funds to aid in the construction and maintenance of municipal streets and bridges.

Montana: H. 129 creates road funds in counties for use in the post-war period.

Nebraska: Bill 234 provides a one-mill levy by counties for raising funds to cooperate with the Federal government in the construction and improvement of county roads.

Nevada: H. 213 authorizes the State Department of Highways to construct and maintain a system of secondary roads. S. 2 authorizes the establishment of post-war reserve funds by counties and municipalities to be used for public improvements.

New Mexico: S. 86 provides for county use of state machinery where such facilities are not otherwise in use, and where county facilities are inadequate.

North Dakota: HCR D requires the Commissioner of Public Roads to establish engineering standards to make it possible for counties to participate in the grant of Federal funds for the construction of farm-to-market roads. S. 205 increases from 6,000 to 10,000 the number of miles the State Highway Commissioner may designate as the secondary-highway system on which secondary or feeder-road funds may be expended.

Oklahoma: H. 139 apportions to each school district levying and using not more than 10-mills tax the revenues accruing to such county and apportioned from motor-vehicle license fees. E. 199 declares the policy that soil is a natural resource and directs the State Highway Commission and the Boards of County Commissioners to rejoin, regrade, construct, or reconstruct all highways if necessary for the purpose of saving and conserving the soil and preventing floods; the cost of the proposed program will be charged to the maintenance cost of the highway system so far as is practicable, plus what amounts, if any, may be added or contributed by Federal agencies. S. 226 appropriates funds and revenues accruing in the state highway construction and maintenance fund to pay the expenses of maintaining and operating the Department of Highways in the construction and maintenance of state highways, secondary or feeder roads and to pay outstanding obligations.

Oregon: H. 270 provides for the establishment of sinking funds by counties for county roads. H. 394 provides for uniform signs along streets and special road districts and the establishment of county roads.

Pennsylvania: H. 632 authorizes County Commissioners to grant right-of-ways and licenses for right-of-ways for roads, pipe lines, etc., on and across land bought by counties at tax sales. H. 724 requires the State Department of Highways to take over in third-class cities all bridges and highways which are maintained by cities or counties. S. 404 provides that the counties' share of liquid-fuel taxes must be maintained in a separate fund and expended only upon approval of the Department of Highways; and permits counties, with the approval of the Department of Highways, to contract for work on the basis of anticipated receipts.

South Dakota: H. 90 empowers the State Highway Commission to cooperate with the Public Roads Administration in the construction of secondary or feeder roads. H. 112 authorizes counties to assist municipalities in the building and maintenance of public streets and alleys within certain municipalities. S. 177 makes necessary the concurrence of the Public Roads Administration in the location, form, and character of informational, regulatory, and warning signs, and traffic signals on streets or roads constructed with Federal Aid.

Tennessee: S. 396 requires the consent of county highway departments for the State Department of Highways to administer the County Road and Bridge Fund. H. 750 requires state and county auditors to audit books and records of all county highway commissions.

Utah: H. 166 permits counties to use Class B road funds for the construction and maintenance of Class A roads through cooperative agreement with the Road Commission; and permits cities and towns to use Class C funds for curb and gutter improvements of Class A roads within municipal limits, also through agreement with the Road Commission.

Washington: H. 208 authorizes state and political subdivisions to accept Federal loans, advances, and grants-in-aid or donations. S. 317 provides that, from monies in the Motor Vehicle Fund distributed to counties, $3,000 per month shall be deducted and turned over to the Department of Highways for supervisor's expenses; and also that after April 1, 1946, 10 per cent of the counties' share shall be divided equally, 70 per cent on the basis of county highways used by school buses and rural mail routes, and 20 per cent on the number of licensed motor vehicles in each county. S. 320 amends the mine-to-market law to permit the expenditure of funds in the improvement of public trails; and appropriates $300,000 from the Motor Vehicle Fund to a special Mine-to-Market Road Fund, 75 per cent to be taken from the state's share of the Motor Vehicle Fund and 25 per

(*Concluded on next page, Col. 4*)

adeco...

NOZZLE TESTER

Keeps Diesel Engines Running Efficiently

To keep diesel engines operating at peak efficiency, this portable, precision-built Adeco Nozzle Tester is indispensable.

Light in weight yet built for heavy-duty service, it enables any mechanic to make quick accurate tests on injector opening pressure, spray pattern, etc., and detect stuck needle valves and leakage around valve seats. Tests both large and small injectors, on bench or engine, at pressures up to 10,000 p. s. i. Prevents costly delays and possible damage to engine.

Ideal for testing hydraulic devices.

•

Write for bulletin on this practical, low-cost unit.

TESTS FUEL INJECTORS AND HYDRAULIC DEVICES at Pressures up to 10,000 p.s.i.

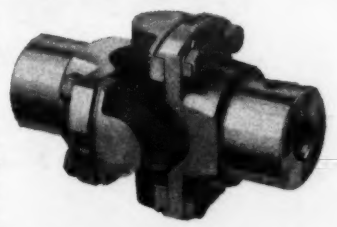
ADECO AIRCRAFT & DIESEL EQUIPMENT CORP.

DEPT. 9: 4411 N. RAVENSWOOD AVE. CHICAGO 40, ILLINOIS

Help Keep Heavy-Duty Industrial Machines ON THE JOB

Machines that must operate in the dust of gravel and coal pits avoid delays and breakdowns — when they are equipped with MECHANICS Roller Bearing UNIVERSAL JOINTS.

Their once-a-season lubrication feature makes unnecessary frequent stops for this purpose. Available in single, double and close-coupled types in all sizes suitable for applications requiring from 200 pounds foot to 50,000 pounds foot torque.



Mechanics Universal Joint Division

BORG-WARNER CORPORATION 2026 Harrison Avenue Rockford, Illinois

MECHANICS Roller Bearing UNIVERSAL JOINTS ARE SERVING IN

Use Anchor

HIGH PRESSURE HYDRAULIC HOSE

These are Factory Engineered and Coupled wire braided flexible hydraulic hose units. Prevent costly lay-up of your hydraulic operated scrapers, graders, loaders, dirt movers, trucks, and snow plows by using these trouble-free hydraulic hose assemblies.

ANCHOR COUPLING COMPANY, Inc.

342 N. Fourth St. Libertyville, Ill.

Factory Branch: 12341 Cloverdale Avenue Detroit, Michigan

DREDGING CONTRACT TRINIDAD BRITISH WEST INDIES

•

The Government of Trinidad is prepared to receive tenders for the dredging of approximately seven million cubic yards of soft material and the formation thereby of 900 acres of reclaimed land. Full particulars may be obtained from the BRITISH COLONIES SUPPLY MISSION, McGill Building, 908 G Street, N.W., Washington, D.C.

The last date for the submission of tenders will be given later.

Ready for the job are two 60 MA Federal trucks recently purchased by the Dunn County, Wis., Highway Department for gravel-hauling operations. Equipped with 130-hp engines, double-reduction rear axles, 5-speed main transmissions and 3-speed auxiliary transmissions, the two 155-inch-wheelbase units have modern hydraulic-hoist dump bodies and carry gross weights of 28,000 pounds each.

Arc Welder Converted To Use Natural Gas

With a shortage of gasoline and an abundance of natural gas in some sections of the country, users of arc welders will be interested in the experience of the Todd Shipbuilding Corp. in converting thirty-five Hobart 300-ampere gasoline-engine-driven arc welders to operate on natural gas.

Although these welders were originally equipped with gasoline carburetors, it proved to be a simple matter to change over to a natural-gas type and hook the engine directly to a natural-gas feed. These thirty-five Hobarts ran on natural gas for several months for use in the in-yard welding training program at the Todd shipyards at Houston, Texas. They are easily changed back to gasoline carburetors when the welders need to be moved to operations where it would not be practical to pipe in natural gas.

Information on the line of Hobart arc welders and how they may be converted to natural-gas operation may be secured direct from Hobart Bros. Co., Troy 1, Ohio, by referring to this publication.

A $156,000,000 Fund For Bay State Roads

Between July 14 and July 24, 1945, highway history was made in the Commonwealth of Massachusetts. On the evening of the first date, the Ways and Means Committee of the State House of Representatives agreed to recommend a $156,000,000 state highway construction program for the six years following the end of the war, with the entire cost coming from the existing gasoline taxes, motor-vehicle licenses, fees and fines, and Federal-Aid. On July 24, Governor Tobin signed the bill, making it a law.

The program provided by this legislation includes:

1. The sum of $90,000,000 to enable the State Department of Public Works to match Federal funds for the construction and reconstruction of state highways.
2. A total of $27,000,000 for constructing, reconstructing, and improving state and other highways to connect or extend existing state highways.
3. $18,000,000 to construct and repair town and county roads.
4. $12,456,000 to aid towns in repairing and improving roads, with the state contribution not to exceed $225 per mile.
5. The sum of $9,000,000 for the construction, reconstruction, and improvement of Metropolitan District Commission boulevards and parkways.

Under this program approximately $18,000,000 will be spent for highway work by Massachusetts during the current fiscal year while the Metropolitan District Commission will expend $1,250,000 during the same period.

Many New State Laws Affect County Roads

(*Continued from preceding page*)

cent from the counties' share.

West Virginia: H. 42 extends the extra 1-cent gas tax for secondary-road purposes until July 1, 1947. S. 61 provides that in making expenditures for maintenance on secondary roads, the State Road Commission shall distribute the available funds justly among the several counties in such manner as will best serve the interests of the state and convenience of its inhabitants; and also provides that any money previously advanced to any county for payment of right-of-ways, and which has not been repaid to the State Road Commission, shall be a charge against and deducted from any funds which may be allocated to such county.

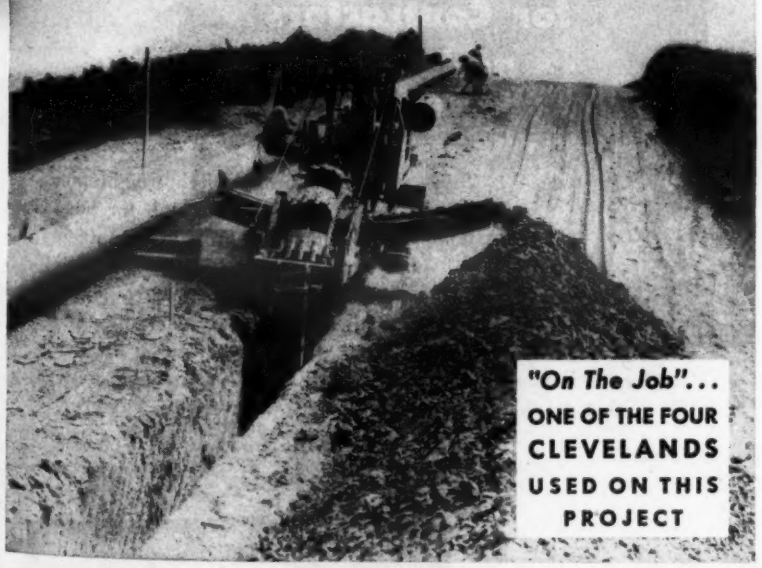
Wyoming: S. 17 requires that road work shall be commenced promptly in counties upon request of Boards of County Commissioners.

Proved Again—

CLEVELANDS' STAMINA SPEED VERSATILITY

ON THE GOLETA PIPE LINE . . .

. . . which had to be built under sidewalks, lawns and paved streets, across mountains, canyons and farm fields, under rivers and along secondary and primary state highways. (16" and 18" natural gas line from La Goleta Field to Los Angeles.)



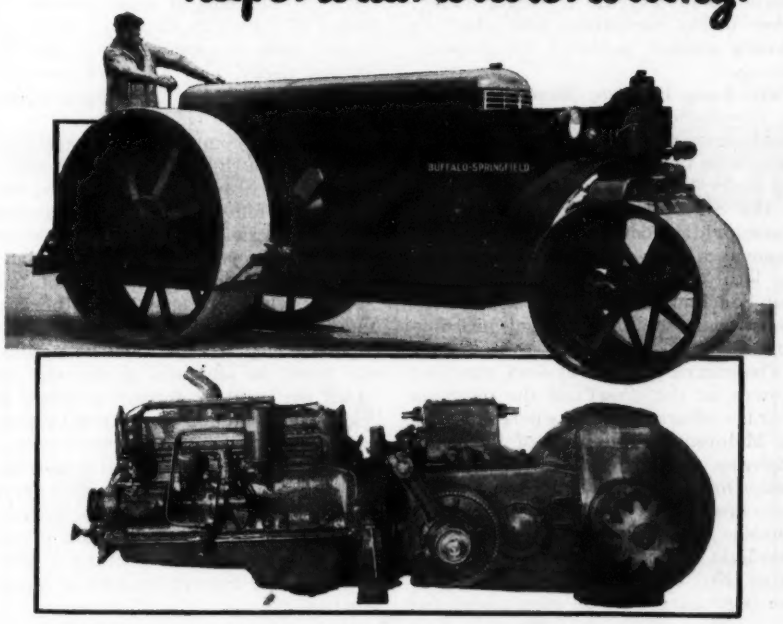
THE CLEVELAND TRENCHER COMPANY

20100 ST. CLAIR AVE. • CLEVELAND 17, OHIO

"CLEVELANDS" Save More . . . Because They Do More

WAUKESHA POWER

keeps road rollers rolling!



Waukesha-powered Buffalo-Springfield 10-12 ton, 3-wheel roller for compaction of subgrade, embankments and foundation material. The huge roller's Model 6-MZR Waukesha Engine, 4-speed transmission, high-speed clutches, and final drive components are a solid one-piece assembly.

• Power plus speed—that's what Waukesha Engines put into Buffalo-Springfield rollers whether they're big 10-12 ton three-wheelers or trench rollers.

Made by The Buffalo-Springfield Roller Co., Springfield, Ohio—the largest exclusive producers of rollers in the world—they're known everywhere for *smoother rolling*.

Just as Waukesha Engines—built by the world's largest builders of heavy-duty internal combustion engines—are equally famous for *smoother running*.

Now every Waukesha is a war-work engine. For your future engine needs—to power shovels, cranes, hoists, pavers, mixers, graders, portable compressors, pumps, welders, rock crushers and screening plants, etc., consult Waukesha now. Get Bulletin 1079.

A Model FC Waukesha Engine powers this Buffalo-Springfield trench roller which is used for either trench rolling or road widening. Some states already *require* the use of this machine on all road widening projects.

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.

NEW YORK • TULSA • LOS ANGELES

MORE POWER FOR VICTORY

WAUKESHA ENGINES

Loose windrowed material, pulled from ditches by a motor grader, is removed by an Athey Model L self-propelled Force-Feed loader. The unit is also adaptable to road widening operations, for salvaging road-surfacing materials, and loading oil-mix for maintenance jobs.

Light Tree-Trimming Regulations in N. J.

The regulations under which utility companies in the State of New Jersey trim trees within the right-of-way on state highways are simple and direct. The utility companies are required to keep the State harmless from any damages resulting from claims which may arise from tree-trimming operations done by the maintenance department of any utility. They are also required to protect the traveling public, other utility companies, and abutting owners against personal or property damage.

The State Highway Department has no jurisdiction in those municipalities in which municipal shade tree commissions have been set up and are operating under 40:64 of the Revised Statutes of the State of New Jersey. In such municipalities, consent for trimming or removal of trees must be obtained from the local commission. Only those trees may be trimmed by a utility which normally come within the legal jurisdiction of the State Highway Department.

The annual removal of dead, diseased growth, or the growth of the previous year is authorized under a permit issued by Maintenance Division of the State Highway Department. Utility companies maintaining pole lines within the state are expected to conduct yearly or periodic tree-trimming operations so that light trimming only will be necessary. No unnecessary trimming or heavy pruning may be done under the permit granted for light trimming.

All work is required to be carried out in a workmanlike manner with due regard to the shape and life of the trees. Only those branches may be removed which actually interfere with or which may menace wires under a snow, ice, or wind load. In particular, the practice of "topping" trees, so as to create a flat or umbrella-shaped top, is forbidden. It is the aim to maintain the natural shape of the tree insofar as is practicable.

All exposed cuts of major growth, in excess of 1 inch in diameter, must be treated with an approved tree paint to prevent decay, and all work done in accordance with the best tree-surgery practice.

The utility companies are cautioned to respect the rights of owners of abutting property and the State does not guarantee immunity from any action, legal or otherwise, which may be taken by abutting owners or owners of land on which the highway may be located.

After work is formally authorized under a permit, the New Jersey State Highway Department must be notified one week in advance of the day on which the utility company proposes to begin work so that a Department representative may go over the work with a company representative. All tree-trimming operations must be done in a manner satisfactory to the field representative or complete cessation of the work may be ordered pending a decision from the Superintendent of Maintenance.

Barber-Greene Dealers

Two distributor firms have been named by the Barber-Greene Co., Aurora, Ill., in the Minnesota, South Dakota, and lower Michigan territories. The Phillippi-Murphy Equipment Co., 360 Hoover St., N. E., Minneapolis 13, Minn., will represent the Barber-Greene Industrial Division in the northeast portion of Minnesota bounded by and including the counties of Koochiching, Itasca, Crow Wing, Carlton, and Aitkin, and covering products sold to mines, pits, and quarries only. The branch office of this company located at 908 No. Main Ave., Sioux Falls, S. D., will represent both the Construction and Industrial Divisions in the entire state of South Dakota.

The territory in the lower peninsula of Michigan west of and including Emmet, Charlevoix, Antrim, Kalkaska, Missaukee, Clare, Isabella, Montcalm, Ionia, Eaton, Calhoun, and Branch Counties, but excluding Berrien County, will be served by the Miller Equipment Co., 558 Bond Ave., N. W., Grand Rapids 2, Mich. This firm will handle B-G construction equipment.

Contractors' Pumps

The Jaeger line of Sure Prime contractors' pumps, ranging in capacities up to 240,000 gph, is described and illustrated in Catalog P45 issued by the Jaeger Machine Co., 701 Dublin Ave., Columbus 16, Ohio. This well illustrated booklet depicts Jaeger pumps in a wide variety of services, including wellpoint jobs, bridge construction, supplying water for road work, unwatering excavations, dams and locks, jetting, and on caisson jobs. Other photos are devoted to the various features of the pumps, supplemented by text describing them in detail. Useful data include rules for determining the pump size and type for a specific job, and tables of pump information.

Copies of this Jaeger Catalog P45 may be secured by interested contractors direct from the manufacturer.

STRAYER PORTABLE CONCRETE PLANTS

20 to 40 YARDS PER HR.

Make 20 to 40 yards of specification concrete per hour on the job. One-man operation and a helper to handle cement bags. One hour to set up. Move from job to job. Write for booklet today to 259 Geist Rd.

ERIE STEEL CONSTRUCTION CO.
ERIE, PENNSYLVANIA
Aggre Meters • Buckets • Concrete Plants • Traveling Cranes

NEW PIPE GUIDE for Contractors and Engineers

On what applications can light-weight pipe do a better job for you?
Why does Naylor Pipe provide advantages found in no other light-weight pipe?
What new development has revolutionized pipe coupling?
The answers to these and many other questions of importance to contractors are presented in the new Naylor Catalog just off the press. Here is a practical guide that provides a working tool for contractors and engineers.

Write for your copy today!

NAYLOR LOCKSEAM SPIRALWELD PIPE

NAYLOR PIPE COMPANY
General Office
1270 EAST 92ND STREET • CHICAGO 19, ILLINOIS
New York Office
350 Madison Avenue • New York 17, N. Y.

The Drinkwater Presto-Lock flexible pipe coupling, designed for plain-end pipe, is easily installed without special tools.

New Speedy Coupling For Smaller Pipes

Faster coupling of 1¼ to 16-inch pipes at lower cost and with greater flexibility is claimed for the new Drinkwater Presto-Lock couplings made by Drinkwater, Inc., 2323 So. Michigan Ave., Chicago 16, Ill. A feature of these couplings is that they can be used with any plain-end pipe without threads, grooves, or flanges. No wrenches or special tools of any kind are required in assembling them. Only a hammer is needed to tighten the wedge keys after the two sections are fitted over the pipe ends and the wedge keys have been inserted in the key channels. The procedure, according to the manufacturer, is so simple that even the most inexperienced workmen can assemble Presto-Lock couplings in a matter of seconds.

The three simple parts of these flexible couplings are two corrosion-resistant malleable-iron castings and the quick-locking wedge key. Sizes 1¼, 1½, 2, 2½, and 3-inch are equipped with one wedge key and chain assembly to prevent loss of the coupling parts, while sizes 3 to 16-inch have two wedge keys but no chain assembly. The gaskets used on these couplings have been specially designed to affect a permanently tight seal on all types of pipe lines. Three types of gaskets are available: synthetic rubber, neoprene, and natural rubber.

Actual tests give a 40-degree flexibility at each joint so that they act as a sleeve, elbow, and ball union at all times. They can be used for repairing any size of leak that the coupling will cover and they withstand all normal working pressures of gas, steam, oil, and water.

An interesting 4-page bulletin giving engineering data and complete specifications on all eleven sizes of Presto-Lock flexible pipe couplings is available on request from the manufacturer. Just mention this illustrated item.

A Buyers' Bulletin Now Available to All

An Industrial Buyers' Bulletin listing equipment ordinarily difficult to obtain but which Precision Equipment Co., 32 No. State St., Chicago 2, Ill., has in stock for immediate delivery may be secured by readers of CONTRACTORS AND ENGINEERS MONTHLY writing direct to this distributor. Among the items listed in the latest bulletin are slide rules, steel shop boxes and stock carts, 12-gage steel work benches and economy tool tenders, steel tool-room shelving inserts for cabinets, and dial counting scales for use in stockrooms.

New Executive V. P. Of Rochester Ropes

Rochester Ropes, Inc., of Jamaica, N. Y., and Culpeper, Va., has announced the election of Colonel Joseph P. Woodlock as Executive Vice President who will take over his duties as soon as he is released from his present assignment as Associate Director of the Office of Surplus Property in the Reconstruction Finance Corp. Prior to this position, he was Executive Officer under W. L. Clayton in the Surplus War Property Administration.

Colonel Woodlock entered the Army shortly after Pearl Harbor, resigning his position as Director of Warehouses for the Crucible Steel Co., New York City. Prior to this for eleven years he was Assistant to the Vice President in Charge of Marketing, B. F. Goodrich Co., Akron, Ohio.

Colonel Woodlock will make his headquarters in Culpeper, Va.

New Electrode Catalog

The complete line of Airco electrodes is described and illustrated in a new 56-page catalog said to be one of the most complete and elaborate books of its kind. Detailed descriptions, applications, welding procedures, mechanical properties, chemical analyses, and specifications of mild, alloy, stainless, and galvanized sheet steels, aluminum, and other non-ferrous metals are included, beginning with a full-color page of color markings of various electrodes cataloged. There are also an electrode selector chart and illustrated sections on Mechanical Properties and Testings and on Approvals. Other subjects covered are plate edge preparation, estimating electrode requirements, and welding symbols; and a hardness conversion table and a glossary of welding terms are included.

Copies of this attractive and informative two-color book are available to our readers upon application to Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y., and mention of CONTRACTORS AND ENGINEERS MONTHLY.

MODEL 80 MODEL 120

Fast, accurate single or multiple cuts with an Electric MallSaw that assure square board ends, save sawing and fitting time and speed up every carpentry job from form construction to general finishing. In addition, MallSaws are readily adapted to cutting metal, cutting and scoring concrete, tile and stone with an abrasive wheel. Ruggedly constructed for continuous hard use, light in weight, easy to handle and easily adjusted for depth and bevel cuts. Available for 110-volt A.C. or D.C.; 220-volt A.C. or D.C. Model 80 has 8″ blade and 2½″ cutting capacity. Model 120 has 12″ blade and 4½″ capacity.

Ask your Distributor or write direct for literature and prices.

MALL TOOL COMPANY, ★ 7743 South Chicago Ave., Chicago 19, Ill.

ARMY ★ NAVY ★ Mall PORTABLE POWER TOOLS

EASIER — FASTER — CHEAPER
with
SYNTRON
Gasoline Hammer
PAVING BREAKERS
100% Self-Contained

No Air Compressor and Hose
No Battery Box and Cable
No Springs

BUSTING concrete
CUTTING asphalt
DRILLING rock
DIGGING shale and clay
TAMPING — and a host of other jobs.

Write for Bulletin No. 8-45

SYNTRON CO.
227 Lexington Homer City, Pa.

THE PROFIT is in the DIGGING!

MORE OUT PUT IN PAY MATERIAL PER BUCKETFUL

★ 20% to 40% lighter than other buckets, type for type.
★ All welded construction for greater strength and durability.
★ Manganese Steel chains, fittings, and reversible tooth points.
★ Full Pay Load every trip, even in wet diggings.
★ Three types; light, medium, and heavy duty. With or without perforations.

⅜ to 30 Cubic Yards

HENDRIX Lightweight DRAGLINE BUCKETS

DESOTO FOUNDRY, INC. · MANSFIELD, LOUISIANA

Levee Slopes Paved With Concrete Slab

(*Continued from page 6*)

away from the job site, on Claiborne Avenue in New Orleans, where all trucks were serviced during the night. Subsequent hauls were made from a batch plant located on Florida Avenue near the Industrial Canal on the outskirts of New Orleans, and only 5 miles from the Chalmette levee. The maximum time of mixing on the run from the batch plant was 30 minutes. The equipment consisted of Smith truck-mixers mounted on Autocars which, in the case of the trucks carrying 4 yards of concrete, had eight driving wheels. These mixers have a capacity of 5 yards but in order to conserve tires were hauling only 4 yards. Samuel Peck was Superintendent for Jahncke Service, directing the operations of the truck fleet.

The trucks delivered the concrete to a Pumpcrete unit set up at the foot of the land-side slope of the levee in a shallow trench dug out to fit the base. A wooden ramp was built alongside the machine up which the trucks backed to unload. A 4-yard truck required 15 minutes to unload into the Pumpcrete so that the six trucks used were enough to keep the Pumpcrete working continuously.

Concrete Mix

The concrete used in this levee paving was a mixture of portland cement, sand, and gravel in about 1:2.6:4.7 proportions, and had a slump ranging from ½ to 2 inches. Specifications required that each cubic yard of concrete should contain not less than 4.5 bags of cement, but the contractor used 5 bags to the yard in order to get better lubrication for pumping. This concrete developed a strength of 3,000 pounds to the square inch in 28 days, or 500 pounds beyond the compressive strength required for this type of construction. Not more than 7.5 gallons of water was used to the bag of cement, and because of the difficulty of placing concrete on steep 2 to 1 slopes the contractor sought to use as dry a mix as could be pumped and worked.

The sand was well graded in the following sizes:

Standard Sieve Sizes	Per Cent by Weight Passing
No. 4	95-100
No. 16	45-80
No. 50	10-30
No. 100	1½-7

The coarse aggregate was washed gravel falling within the following limits:

Standard Square Mesh Screen	Per Cent by Weight Passing
1½-inch	100
1-inch	90-100
½-inch	40-70
No. 4 sieve	0-6

Pumping the Concrete

The concrete was pumped to the forms by a Rex Model 160 Pumpcrete equipped with a single-stroke pump having a capacity of 20 cubic yards per hour. The 7-inch discharge opening at the pump was reduced to 6 inches, the diameter of the pipe used. Since the machine was equipped with 660 feet of pipe line, it had to be set up in only two locations to distribute concrete to the 2,170 linear feet of levee paving. Water to cool the Pumpcrete machine was taken from the Mississippi by a Rex 3-inch centrifugal pump with a reducer to a 1½-inch rubber hose, 250 feet long, which ran from the river up over the levee to the Pumpcrete on the land side. Two men worked at the machine, one operator and a laborer who spotted the trucks, guided them on the ramp, and kept the hopper of the Pumpcrete machine always filled. The flow of concrete from the Pumpcrete was controlled by signals given by one of the concrete crew from the top of the levee.

The pipe line to the forms consisted of standard 5 and 10-foot lengths of 6-inch pipe with an assortment of smaller lengths and the usual 45 and 90-degree angle bends. Most of the line was strung out with 10-foot lengths. The pipe was laid on the river-side slope just below the crown of the levee, which was 9 feet above the Pumpcrete machine. To support the pipe, a 2 x 4 stake was driven into the levee slope about every 10 feet, just far enough below the top of the levee so that a piece of 2 x 4 could be nailed to it and be level with its other end on the levee crown. Being supported off the ground, the pipe could be disconnected more easily and the joints were kept free from dirt.

Three men ran out the pipe line in the morning to the farthest limits of the day's pour, and then broke off the lengths as the work progressed towards the pump. This crew also handled the placing of the concrete in the forms.

Placing the Concrete

From the end of the pipe line the concrete was chuted into a trough which was made up of four sections 8 feet long and 18 inches wide with a 6-inch invert. The slab at the toe was poured first and lengths of the trough were taken off as the concrete pour proceeded up the slope. Prior to concreting, the levee slope had been wet down with river water delivered by a Jaeger 3-inch centrifugal pump mounted on a 2-wheel pick-up which was rolled along the bank. A reducer on the pump permitted the use of a 1-inch rubber hose. This hose was also used to wash out the Pumpcrete pipe.

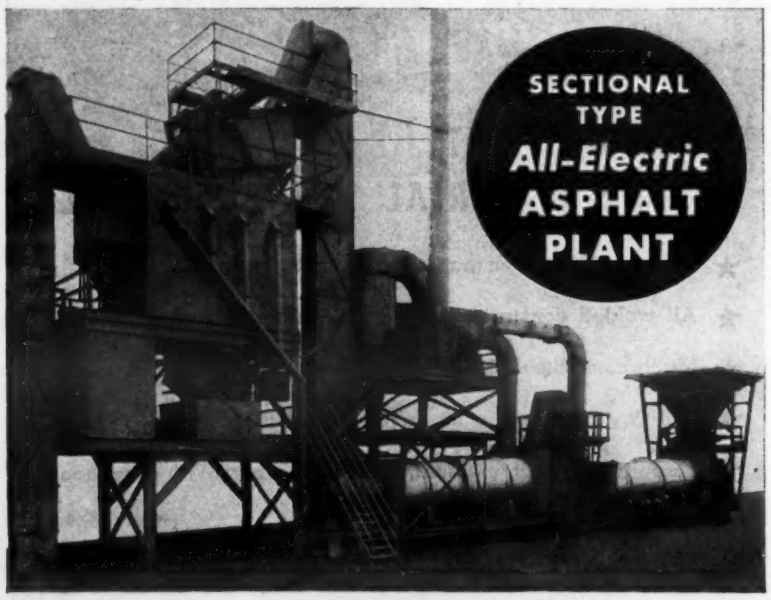
Two puddlers with shovels and one with a rake leveled off the concrete as it slid off the chute, while two finishers removed the steel cap supporting the felt expansion joints. The puddlers then struck off the concrete with a 2 x 4 screed, after which two other finishers, using floats 2 feet long x 4 inches wide, gave the concrete a rough but fairly uniform finish. They worked around the expansion joints and saw that they were kept in proper position. These finishers had secured a couple of pieces of old tire casings which they had cut into sections 8 to 10 inches long and tied around their knees for protection when they were kneeling either on the ground or on a previously poured slab.

Immediately behind the finishers came a man with a 3-gallon Hudson spray tank filled with Truscon No. 6 curing compound to cover the concrete and retain the moisture so that shrinkage cracks would not develop in the very dry mix.

Backfilling the Levee Toe

The concrete was permitted to set for 14 days before backfilling operations were begun along the toe of the slope. Half of the material that had been excavated by the dragline was then pushed back into place by a Bucyrus-

(*Concluded on next page*)



SECTIONAL TYPE
All-Electric
ASPHALT PLANT

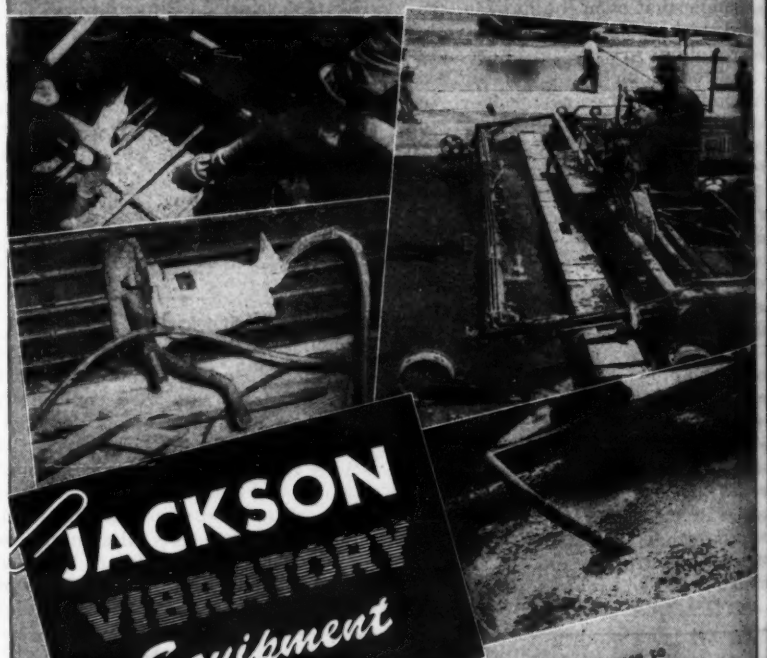
H & B

ELECTRICAL EQUIPMENT COMPLETELY INSTALLED

This sectional type H & B asphalt plant is completely electrical in operation, with all units driven by individual motors—no chains or countershafts. All units are wired completely at our factory. Once the plant is assembled you are ready to hook up to the power line and start operating. The plant is quickly assembled and disassembled, and easily portable. Refinements in design include a larger fan, new horizontal cyclone dust collector and new type screen, making for greater compactness and increased efficiency. Write for complete information.

HETHERINGTON & BERNER INC.
731 Kentucky Avenue — Indianapolis 7, Indiana

The RIGHT Answer
to EVERY VIBRATOR PROBLEM
in the Concrete Construction Field!

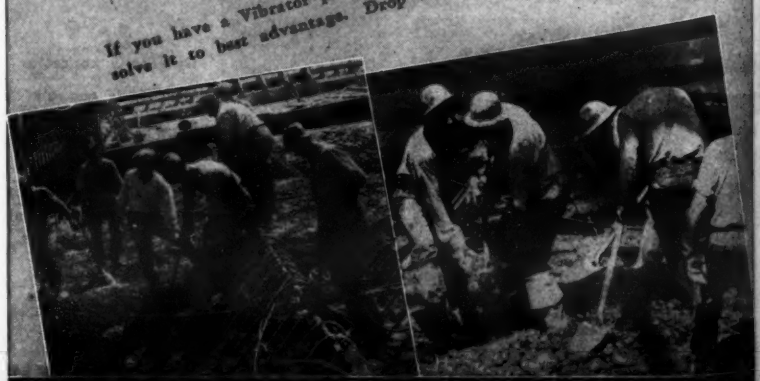


JACKSON VIBRATORY Equipment

Stick this in your hat for future reference: For each and every purpose to which Vibrators are applicable in the concrete industry, we can supply the equipment that will give you not only the best and fastest placement, but also the maximum of dependability and trouble-free service. Our long famous JACKSON line includes many vibrators of both the internal and external type; the finest equipment available for:

General Construction ★ Light Construction ★ Mass Concrete ★ Hard-to-get-at Places ★ Form Vibrating ★ Floors, Streets and Highways ★ Pipe Manufacturing ★ Movement of Materials ★ Vibratory Tables, etc.

If you have a Vibrator problem, by all means let us show you how to solve it to best advantage. Drop us a line. No obligation, of course.



ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON — MICHIGAN

Levee Paving

(Continued from preceding page)

Erie bulldozer on an International tractor. When this was well compacted by the tractor running over it, the remainder of the dirt was pushed back to about a 3-foot depth over the toe of the slope paving and also compacted.

Contractor's Crew

An average of 20 men made up the force doing the work on this levee paving and consisted of a Pumpcrete operator and an operator for either the tractor or dragline; 2 carpenters for form work; 2 truck drivers who hauled the workers back and forth from New Orleans in two Ford 1½-ton trucks, used also for transporting material; 4 men for pipe handling and puddling concrete; 4 concrete finishers; 4 laborers for hand grading, tamping, leveling, and assisting the Pumpcrete operator; a laborer for putting on curing compound and washing pipe; and the labor foreman. The crew was colored except for the foreman, the carpenters, and the equipment operators.

This project was started on December 18, 1944, and was completed in a month's time on January 18, 1945. Along the 2,170 linear feet of levee there were 775 "squares", a term used in this type of work to denote an area of 100 square feet. The cost of this paving was around $17,850.

Historical Site

The Chalmette levee protects some interesting and historical ground. Here it was that the American forces under Andrew Jackson defeated the British invasion army on January 18, 1815, and back from the levee are four large oaks on the Bienvenu Plantation under which the British commander Pakenham died of wounds suffered in the battle for New Orleans. The Chalmette National Cemetery lies just behind the levee. Here also are located the famed and beautiful de la Ronde Oaks planted on the Versailles Plantation in 1783, and which at the age of 162 years have attained a girth of from 20 to 30 feet and are covered with picturesque Spanish moss. The new concrete slope paving will protect the levee from erosion, preventing any possible break-through into this historic area.

Personnel

This levee paving at Chalmette, La., was done by R. P. Farnsworth Co., Inc., of New Orleans for the U. S. Engineer Office, New Orleans District, of which Colonel George H. Hudson, Corps of Engineers, is District Engineer, and Major A. H. McRae is Executive Assistant to the District Engineer. Walter C. Carey is Chief of the Inspection Division of the District, and J. W. Frankenbush supervises inspection in the Structures and Revetment Section which includes levee paving. Marion C. Allen was Superintendent for the contractor, and James G. Ruiz, Inspector for the U. S. Engineer Office.

Representation Abroad For Tyson Bearing Corp.

The Tyson Bearing Corp., Massillon, Ohio, manufacturer of tapered roller bearings, has joined eighteen other manufacturers in naming the Borg-Warner International Corp., Chicago, as its sales representative in all export markets with the exception of Canada and Alaska. This arrangement will mean a considerable saving to the overseas distributors since shipments from all concerns will be consolidated at Borg-Warner International's Auburn, Ind., warehouse for forwarding abroad on a single bill of lading.

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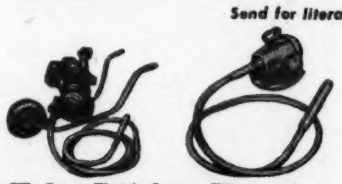

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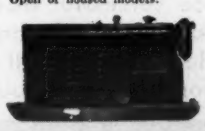

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